

 **KENWOOD/TRI**O

SERVICE MANUAL

Model TR-7010



2m SSB TRANSCEIVER

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SPECIFICATIONS

GENERAL

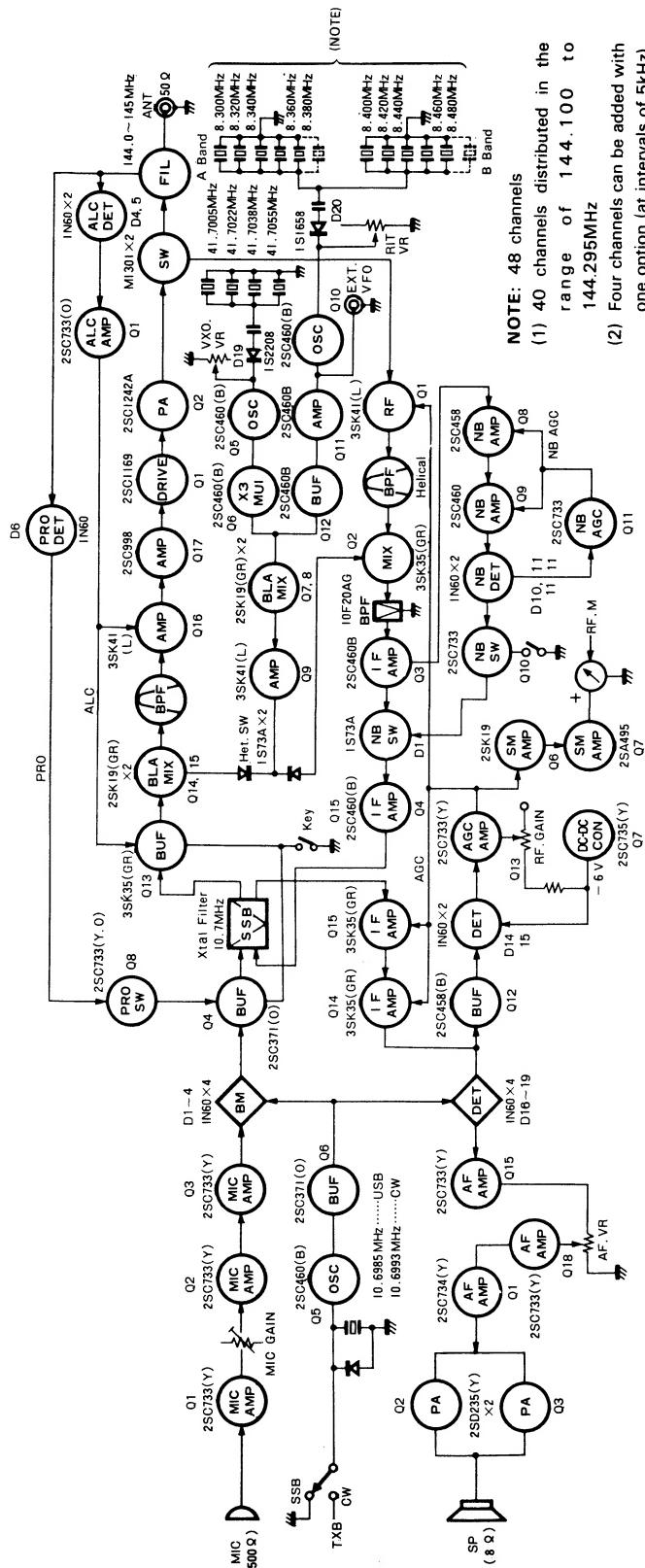
Semiconductor: 34 transistors, 12 FETs, 72 diodes
Frequency Range: 144.0 ~ 145.0MHz
Number of Built-in Channels: 40 channels
Frequency Range of Built-in Channel: A band 144.100 ~ 144.195MHz
B band 144.200 ~ 144.295MHz
Operating Temperature: -20°C ~ +60°C
Standard Power Supply
Voltage: DC 13.8V
Working Voltage: DC 11.5 ~ 16.0V
Grounding: Negative grounding
Antenna Impedance: 50Ω
Power Consumption: 40VA (DC 13.8V)
Approx. 600mA in receive
with no input signal
Approx. 3A in transmit
Dimensions: 180(W) × 60(H) × 240(D)
mm
Weight: 2.7kg

TRANSMIT SECTION

Type of Emission: A1, A3J (USB)
Rated Input: 13.5V 20W
Rated Output: 8W
Modulation: Balanced modulation
Spurious Radiation: Less than -60dB
Carrier Suppression Ratio: More than 40dB
Side-band Suppression Ratio: More than 40dB
Microphone and Sensitivity: 500Ω, dynamic type, with press-talk switch, -72dB ±3dB
Transmit Frequency Characteristic: Characteristic — 500 ~ 2500Hz (-6dB)

RECEIVE SECTION
Receiving System: Single superheterodyne
Intermediate Frequency: 10.7MHz
Sensitivity: 0.5µV (S/N = better than 10dB)
Image Rejection: More than 60dB
Spurious Interference: More than 60dB
Pass Band Width: Less than 2.4kHz (at -6dB)
Selectivity: Less than 4.8kHz (at -60dB)
Audio Output: More than 1.5W (10% distortion, 8Ω load)

BLOCK DIAGRAM / FEATURES



1. All solid-state, handy SSB car transceiver which operates in the band of 144MHz.
2. TR-7010 which operates in SSB (A_3J) and CW (A_1) modes is so designed as to serve as a fixed station.
3. By the adoption of a frequency synthesizer 40 channels at intervals of 5kHz are provided.
4. AUX circuit has 18 channels, and it is possible to add another 4 channels with one crystal.
5. An external VFO connection terminal is provided.
6. Kenwood's unique noise blunker circuit whose high performance in the HF range has proven effectively eliminates noise arising from ignition.
7. A premixer and a balanced type HET mixer with FET are used to prevent spurious responses during transmission.
8. A six-element crystal filter is used in the IF stage so that a high level of selectivity is obtained.
9. An RF gain control of threshold type is used to obtain an optimum S/N ratio throughout SSB reception.
10. AGC circuit of amplifier type is used to obtain distortion less sound during reception, and ALC circuit is used to inhibit splatter and minimize wave distortion during transmission.
11. "ON AIR" pilot lamp which lights during transmission is provided.
12. RIT circuit with ON-OFF switch permits the frequency of only the incoming signal to be varied by about $\pm 1.5\text{kHz}$.
13. Fittings for car mounting, power cord, stand, microphones and all other necessary accessories are provided.
14. VXO circuit permits both the transmit and reception frequencies to be varied by $\pm 2.5\text{kHz}$ or more at the same time, so that TR-7010 can continuously cover all the frequencies of 40 channels divided at intervals of 5kHz.

NOTE: 48 channels
(1) 40 channels distributed in the range of 144.100 to 144.295MHz
(2) Four channels can be added with one option (at intervals of 5kHz).

CIRCUIT DESCRIPTION

GENERAL:

TR-7010 is composed of 34 transistors, 12 FETs and 72 diodes. The block diagram is shown on Page 4. The following are the major functional units contained in TR-7010:

Types of Units and Arrangement:

1. Synthesizer unit (X50-1240-00) Upper side
2. RX unit (X55-1080-00) Lower side
3. Carrier unit (X50-1230-00) Lower side
4. Final unit (X45-1040-00) Upper side
5. Filter unit (X51-1110-00) Lower side

In the synthesizer unit, 4 crystals for 41MHz band and 10 crystals for 8MHz band are combined to provide 40 channels of 133MHz band. The frequency obtained is fed to the transmit and receive MIX circuits by means of the diode switch, as a heterodyne signal.

In the transmitting section, SSB signal of 10.7MHz and heterodyne signal of 133MHz are mixed to obtain a 144MHz frequency which is power amplified to 8W of rated output.

In the receiving section, the receive frequency of 144MHz band and the heterodyne frequency of 133MHz band are mixed to obtain 10.7MHz IF frequency.

The IF frequency is combined with a carrier and is fed to the detector circuit through the crystal filter for SSB detection, thus AF signal being obtained.

Both the transmitting section and the receiving section are provided with various auxiliary circuits and connecting terminals to ensure maximum performance and reliable operation.

Auxiliary Circuits:

1. S/RF meter
2. Noise blanker circuit
3. Amplification type AGC
4. Amplification type ALC
5. RIT circuit
6. VXO circuit
7. ON AIR indicator circuit
8. Final stage protection
9. CW circuit
10. Transmitting/receiving antenna, diode selector circuit
11. RF gain control
12. Frequency synthesizer
13. Additional channels

Auxiliary Terminals:

1. ANT
2. EXT SP
3. EXT VFO
4. KEY
5. DC
6. MIC

1. Synthesizer Unit (X50-1240-00)

The 41MHz band crystal is oscillated (3rd over tone) by Q5 (2SC460 (B)), and the oscillated frequency is tripled by Q6 (2SC460(B)) to produce 124.9MHz band signal. D19 (1S2208) is connected between Q5 and the crystal to enable the frequencies for both the transmitter and receiver to be varied by the VXO volume control.

The 8MHz band crystal is oscillated by Q10 (2SC460(B)), and the oscillated frequency is amplified through the buffer amplifier, which, together with the above 124.9MHz band signal, is fed to the balanced mixer circuit composed of Q7 and Q8 (2SK19 (GR)). The frequency of the 8MHz band crystal can be selected either to 144.1MHz or 144.2MHz band by means of the BAND selector switch. When the switch is set to 144.2MHz band, the indicator (light emission diode: D102) will be illuminated. The oscillator circuit can be added a variable capacitance diode (D20) for RIT control, thus the receiving frequency can be varied by setting the RIT switch to ON during receive mode.

The balanced mixer circuit is balanced by VR1 (1kΩ). When the circuit is under perfectly balanced condition, each signal being fed is mixed and, therefore, they do not appear on the output circuit. Consequently, the 133.4MHz signal produced by the balanced mixer circuit has less spurious component. Since this signal passes through B.P.F. composed of 4 coils, the injected signal of ±8MHz is further suppressed. The signal passing through B.P.F. is amplified by Q9 (3SK41(L, M)) and is then fed to the transmit or receive mixer circuit through the diode switch, as a heterodyne frequency.

In the transmitting mode, the light emission diode (D101) in the ON AIR indicator is illuminated while the 133.4MHz signal is fed to the balanced mixer circuit consisting of Q14 and Q15 (2SK19(GR)), together with the 10.7MHz IF signal which is amplified by Q13 (3SK35 (GR, BL)) after passing through the SSB filter. This signal is then heterodyned to 144MHz, passes through B.P.F. and HF amplified by Q16 (3SK41(L, M)) and Q17 (2SC998) so that it is fed to the driver of the final unit.

The bias of IF amplifier (Q13) and HF amplifier (Q16) are controlled by ALC.

In the receiving mode, the supply voltage of AF power amplifier (Q2, Q3) is turned to ON, thereby the AF signal amplified by Q18 and Q1 is further amplified to drive the speaker.

2. Final Unit (X45-1040-00)

The 144MHz input signal is amplified by the driver Q1 (2SC1169) and power amplified by Q2 (2SC1242A) to the rated output of more than 8W. The amplifier used is of AB1 class to improve the

CIRCUIT DESCRIPTION

linearity; the base circuit is biased by 9V of stabilized voltage while the drive stage employs Q3 (2SD235 (Y, O)) for stability of power supply. The output passes through the π matched circuit and the low pass filter in the filter unit, thus reducing the spurious radiation.

3. Filter Unit (X51-1110-00)

The filter unit is composed of the diode type antenna selector circuit, filter circuit, protection circuit, ALC detector and amplifier circuit, and the control unit with RF meter signal detector circuit.

In the ALC circuitry, the transmit output is detected by D4 and D5, passes through the control volume VR3 and is ALC amplified by Q1 (2SC733) to control the amplifier circuit (Q13, Q16) of the synthesizer unit.

The protection circuit detects the reflection wave by the SWR detector circuit when the load becomes abnormal during transmit mode; it is detected by D6 and the DC component is fed to the protection switching circuit (Q8) of the carrier unit.

4. Carrier Unit (X50-1230-00)

The 10.6985MHz crystal is oscillated by Q5 and the oscillated signal is used as a carrier for transmission and reception.

In the SSB transmitting mode, the 10.6985MHz carrier signal is fed to the balanced modulator circuit (D1 ~ D4), together with the audio signal amplified by Q1, Q2 and Q3, producing DSB of 10.7MHz band. Since this circuit is a balanced circuit, the 10.6985MHz signal is suppressed and DSB output appears at the output side only when the audio signal is added to it.

The DSB signal thus produced passes through the buffer circuit (Q4) and the 10.7MHz crystal filter, and is then converted into SSB signal of USB so that it is applied to the IF amplifier (Q13) of the synthesizer unit.

In the CW MODE, the 10.6985MHz signal is shifted by D8 (1S2208) to 10.6993MHz while also it is unbalanced by adding a DC voltage through S203 to the balanced circuit, to produce a carrier for keying the emitter of Q4.

Q8 is used as a protection switch, controlling the buffer circuit (Q4) by the DC component after the reflection wave from the final unit is detected.

Q7 is a DC-DC oscillator circuit. The 400Hz signal oscillated from this circuit is rectified by D10 ~ D13, which passes through D14 to produce -6V of voltage. This voltage is supplied to the AGC amplifier (Q13) of the RX unit. The voltage shunted by R30 is applied to the IF amplifier (Q5) through the RB terminal on the RX unit.

5. RX Unit (X55-1080-00)

The 144MHz band signal selected by the diode switch is applied to the gate of Q1 (3SK41) from L1 and L2, and is RF amplified. The helical tuning circuit provided between the RF stage and the mixer stage is used to attenuate the signal waves outside the band. The 144MHz band signal picked up from the helical circuit is fed to the mixer circuit (Q2), together with the 133.4MHz signal premixed in the synthesizer unit. In this manner, the 10.7MHz output taken from L6 and L7 is amplified through the IF amplifier.

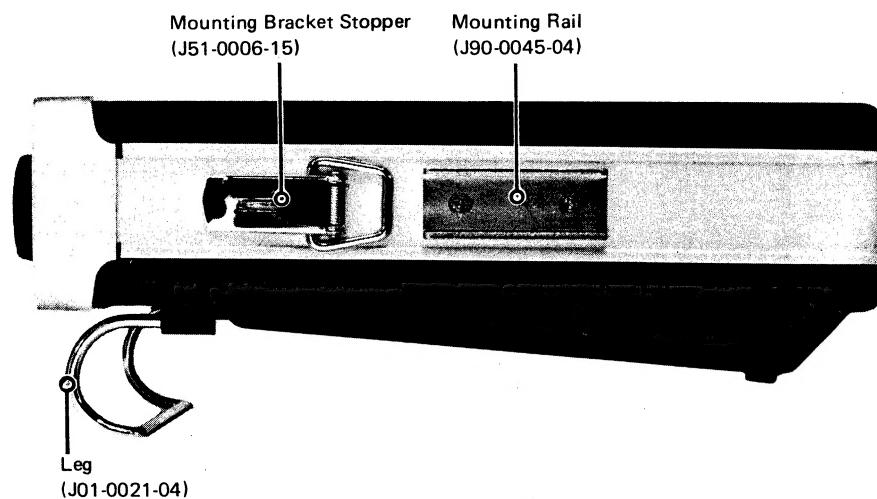
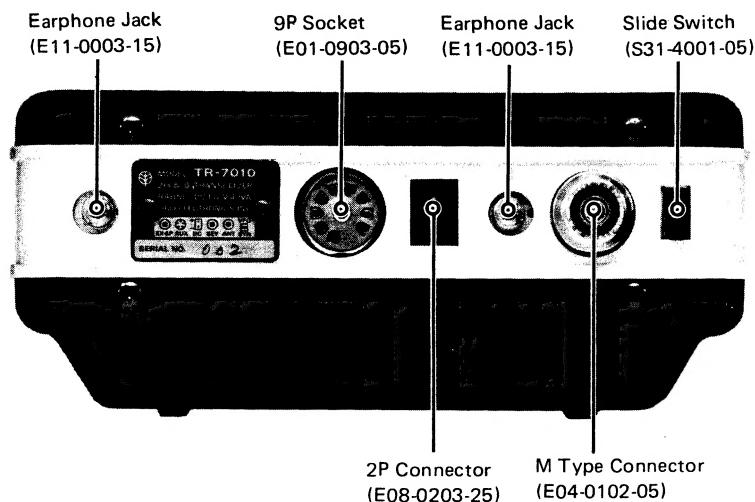
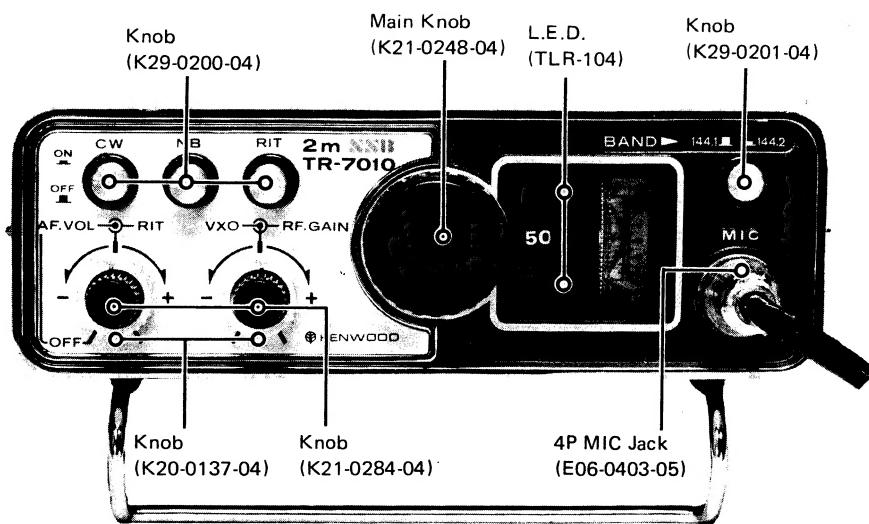
The IF signal passing through the 10.7MHz SSB crystal filter is further amplified by Q5 and Q14 and is applied to the balanced detector circuit composed of D16 ~ D19 including the secondary side of L22. At the same time, the signal from the carrier unit is fed to the circuit through the CAR terminal so that it is picked up as AF signal which is amplified by the AF amplifier (Q15) after passing through the filter.

The NB circuit takes IF signal from Q3 and controls D1 when the NB switch is turned to ON, reducing pulse noise such as ignition noise.

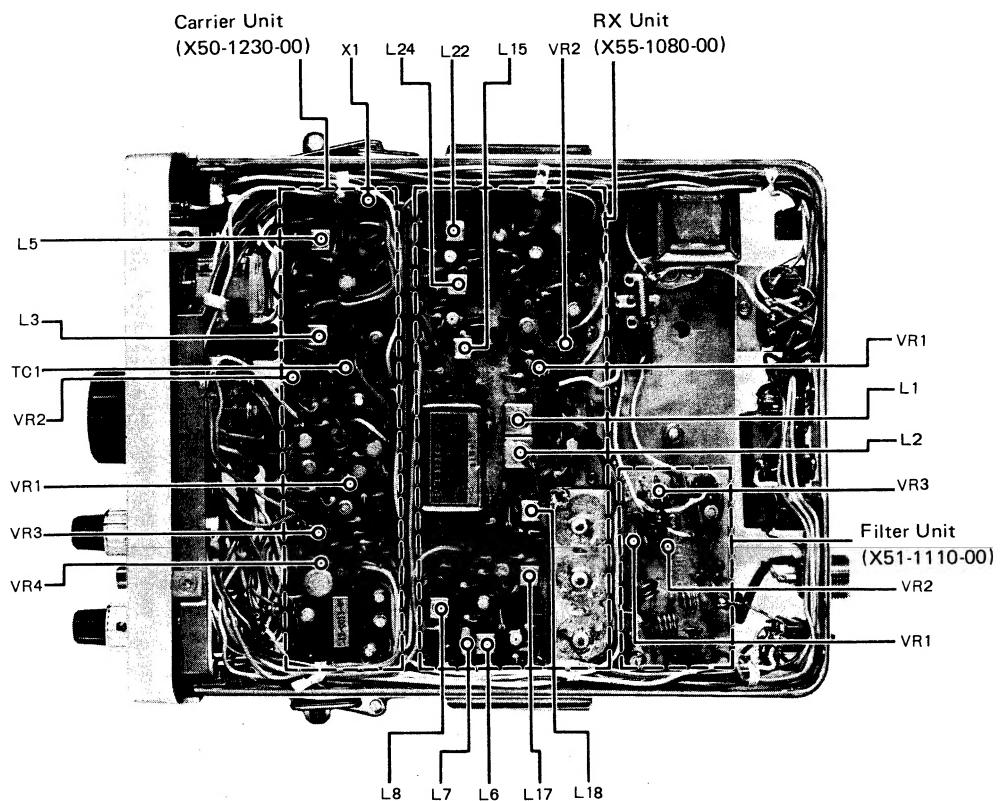
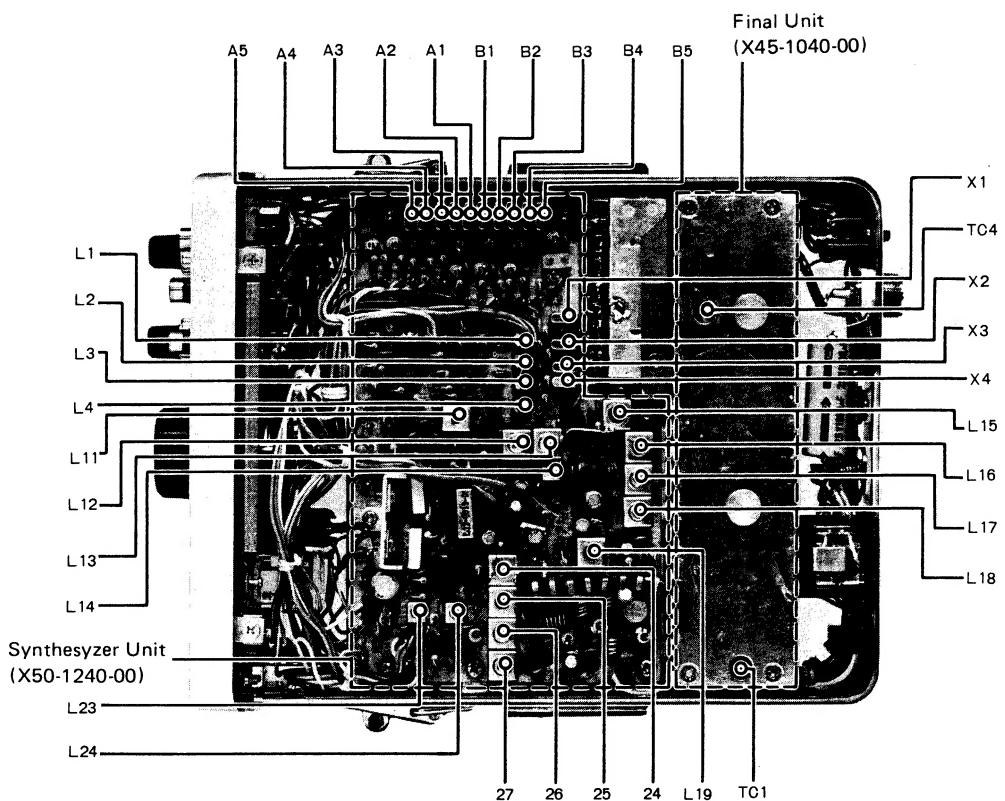
The amplification type AGC circuit takes IF signal from Q14. This signal is amplified by Q12 and Q13 to control the levels of Q1, Q5 and Q14 with the use of the RF gain volume control, thus the cross modulation is suppressed and distortionless sound is obtained.

The S meter circuit is used to amplify the AGC variation factor through Q6 and Q7. The amplified signal passes through switching diode D8 to activate the S meter.

PARTS ALIGNMENT

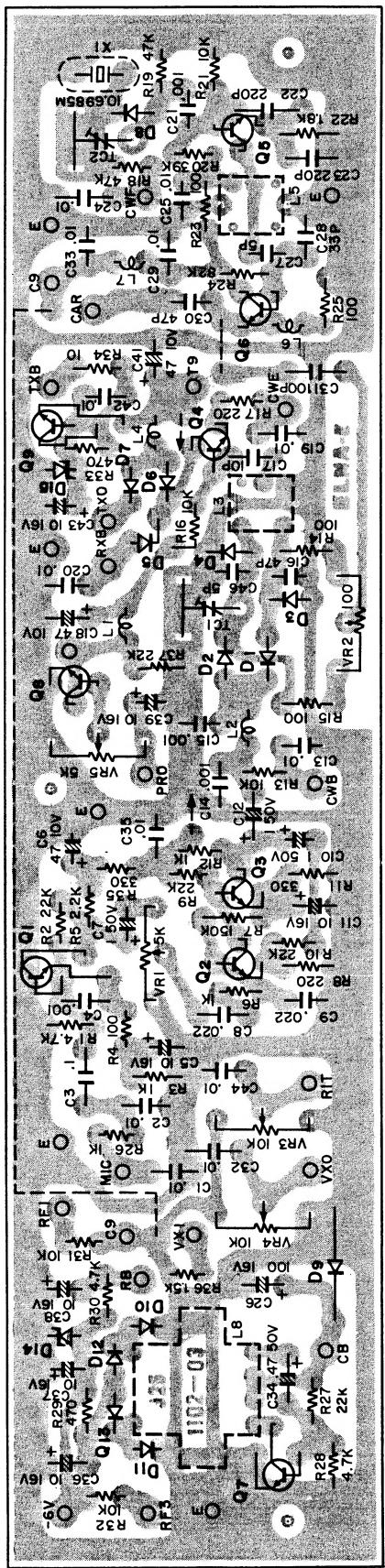


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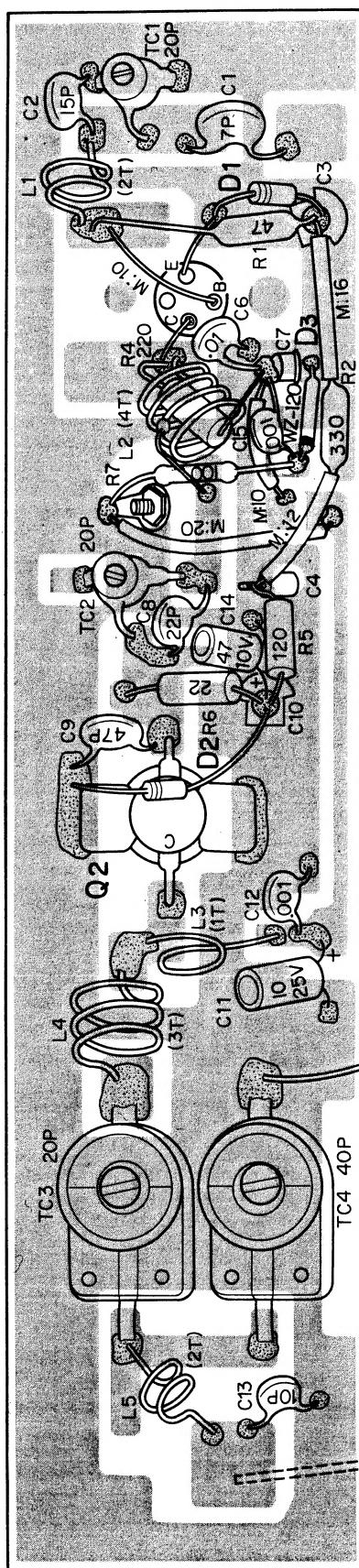


PC BOARD

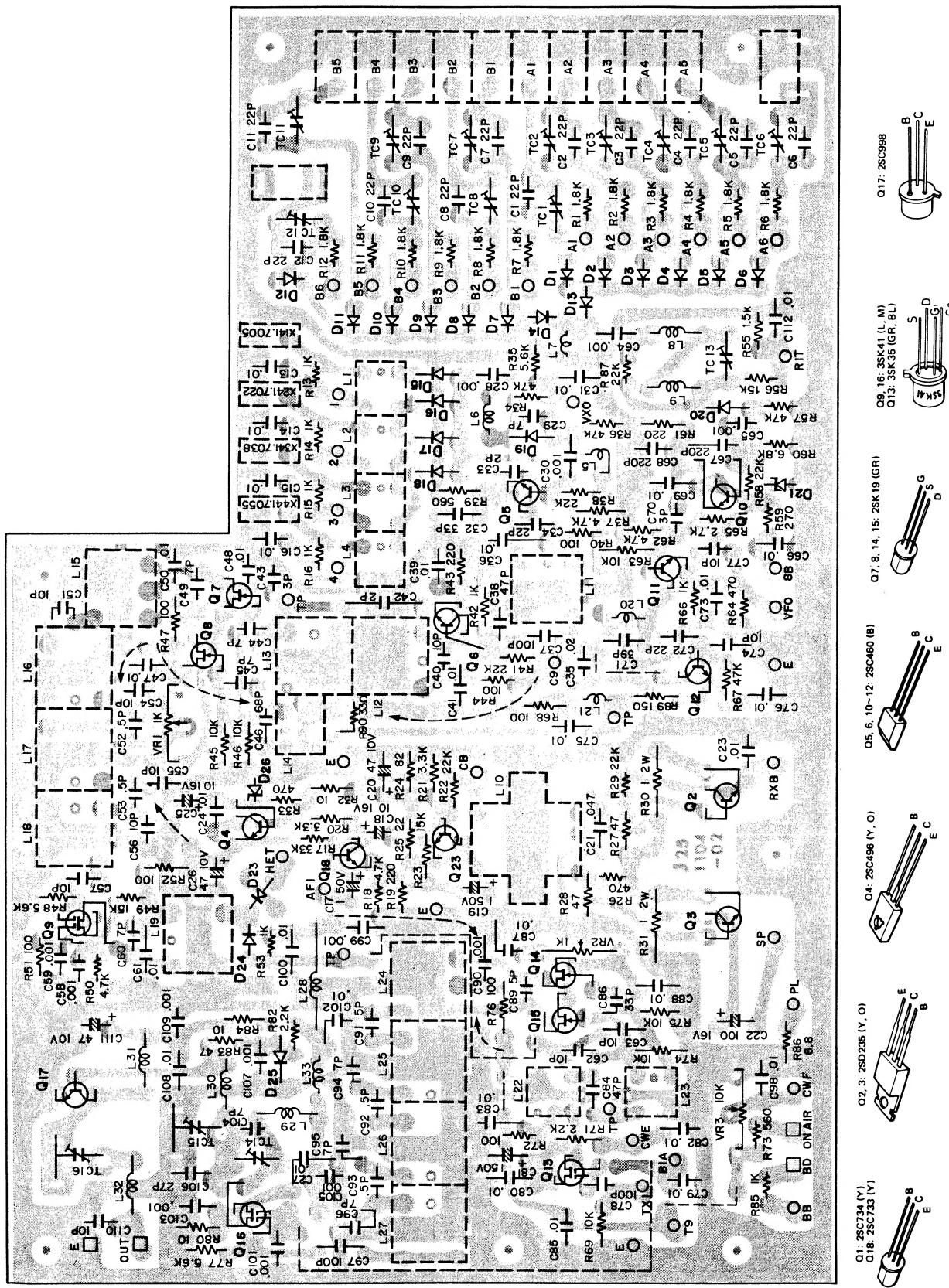
▼ CARRIER UNIT (X50-1230-00)



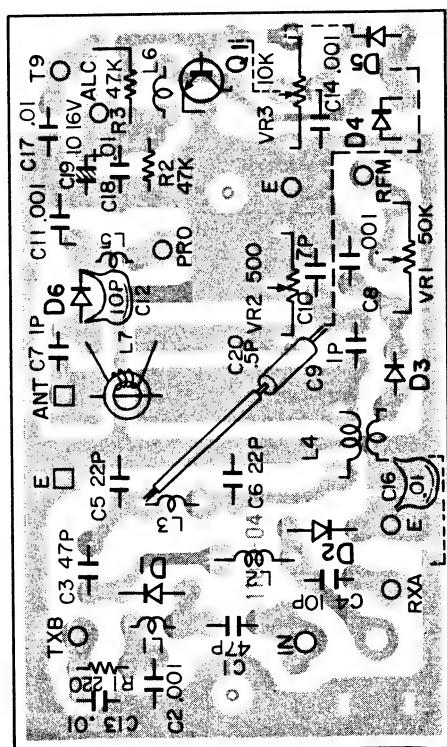
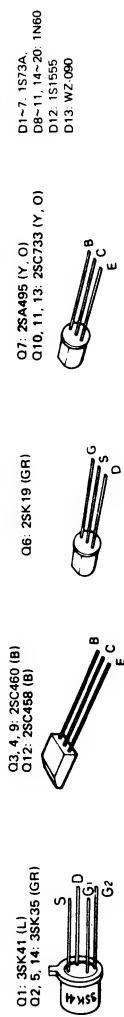
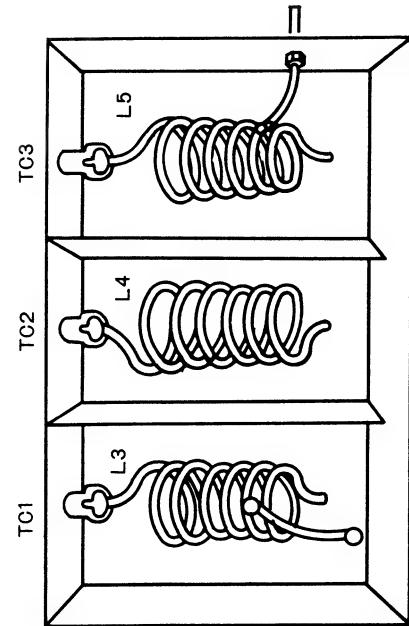
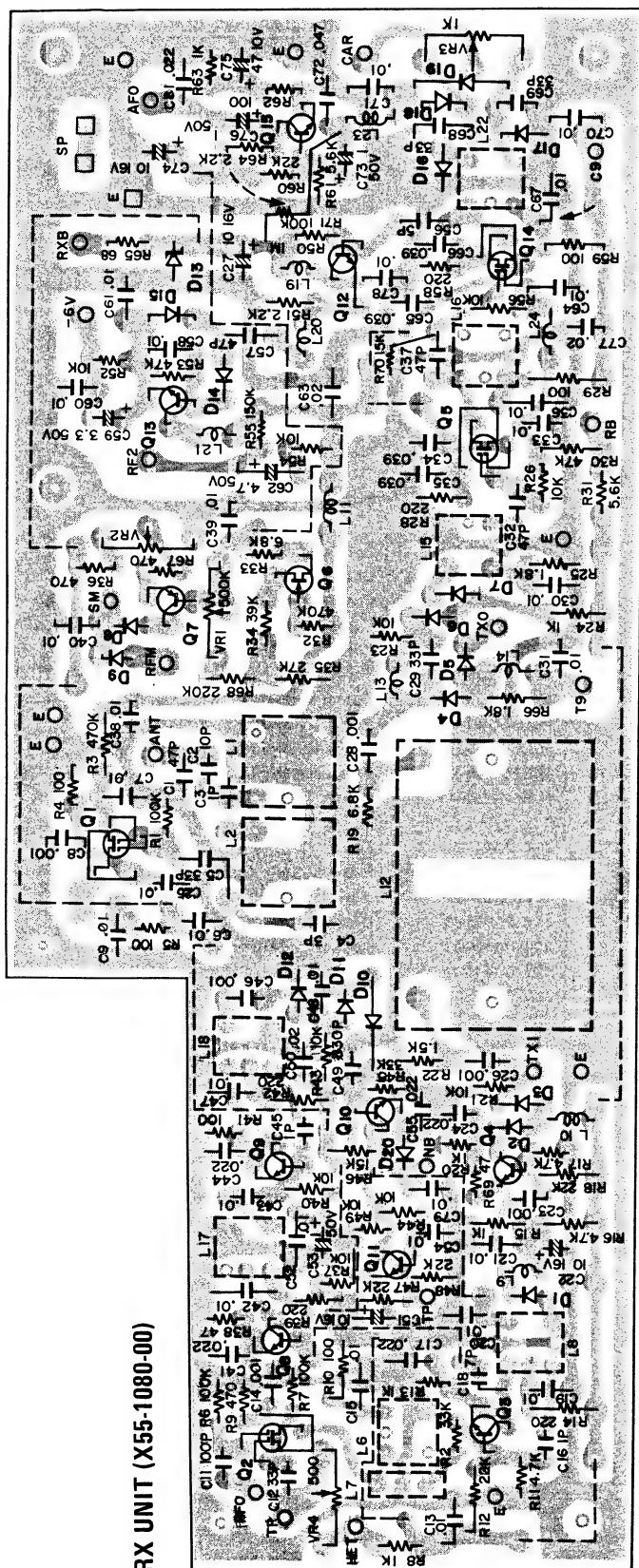
▼ FINAL UNIT (X45-1040-00)



PC BOARD



PC BOARD



a1: 2SC733 (Y) or (O)
D1, 2: M1301
D3 ~ 6: IN60

PARTS LIST

061: For Europe except for England

051: Only for England

| Ref. No. | Parts No. | Description | Re-marks |
|----------------------|--------------|--|----------|
| CAPACITOR | | | |
| C101 | CE02W1E102 | Electrolytic 1000μF 25WV | |
| C102~105 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C106 | CK45D1H102M | Ceramic 0.001μF ±20% | |
| C107 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C108 | CC45SL2H150J | Ceramic 15pF ±5% | |
| C109 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C110 | CC45SL1H101K | Ceramic 100pF ±20% | |
| C111 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| RESISTOR | | | |
| R101 | PD14BY2E472J | Carbon 4.7kΩ ±5% | |
| SEMICONDUCTOR | | | |
| D101,102 | V11-0304-05 | L.E. Diode TLR-104 | |
| D103 | V11-0076-05 | Diode 1S1555 | |
| POTENTIOMETER | | | |
| VR101,102 | R06-9004-05 | 5kΩ(A) AF(with power switch) 10kΩ(B) RIT. | |
| VR201,202 | R06-3007-05 | 10kΩ(B) RF GAIN,10kΩ(B)VXO | |
| SWITCH/RELAY | | | |
| S1 | S01-2027-05 | Rotary switch | |
| S2~4 | S40-3007-05 | Push switch | |
| S5 | S40-2039-05 | Push switch | |
| S6 | S31-4001-05 | Slide switch | |
| RL1 | S51-2002-05 | Relay | |
| COIL | | | |
| L101 | L15-0001-05 | Choke coil (low frequency) | |
| L102 | L33-0074-05 | Choke coil 0.022μH | |
| MISCELLANEOUS | | | |
| — | A01-0174-02 | Case (B) | |
| — | A01-0175-02 | Case (C) | |
| — | A10-0401-02 | Chassis | |
| — | A20-0810-05 | Panel | |
| — | A21-0181-04 | Dressing panel | |
| — | A21-0201-04 | Dressing panel | 051 |
| — | A22-0160-03 | Subpanel | 061 |
| — | A30-0091-04 | Dial board | |
| — | B01-0090-03 | Escutcheon | |
| — | B03-0071-14 | Dial mask | |
| — | B05-0163-14 | Speaker grille cloth | |
| — | B10-0164-04 | Front glass | |
| PL1 | B30-0002-05 | Pilot lamp (12V, 3W) | |
| — | B31-0194-05 | S meter | |
| — | B40-1021-04 | Model name plate | |
| — | B42-0540-04 | Dressing name plate (Band indication) | |
| — | B50-1290-00 | Operating manual | 061 |
| — | B50-1369-00 | Operating manual | 051 |
| — | D32-0010-04 | Relay stopper | |
| — | E01-0903-05 | 9P socket (jack) | |
| — | E04-0102-05 | M type connector | |
| — | E05-0901-05 | 9P socket (plug) | |
| — | E06-0403-05 | 4P mic jack | |
| — | E08-0203-25 | 2P connector (jack) | |

| Ref. No. | Parts No. | Description | Re-marks |
|----------|-------------|------------------------------|----------|
| — | E09-0203-25 | 2P connector (plug) | |
| — | E11-0003-15 | Earphone jack x 2 | |
| — | E12-0001-05 | Phone plug | |
| — | E15-0038-05 | PL socket | |
| — | E18-0801-05 | Relay socket | |
| — | E22-0216-05 | Lug board | |
| — | E29-0046-04 | Repeating hardware x 2 | |
| — | E30-0234-15 | Wire (for TX) | |
| — | E30-0355-05 | Wire (for speaker) | |
| — | F05-4022-05 | Fuse x 2 | |
| — | F07-0312-04 | Shield cover | |
| — | F10-0346-04 | Shield plate (A) | |
| — | F10-0351-04 | Shield plate (B) | |
| — | F15-0128-04 | Shading plate x 2 | |
| — | G13-0014-04 | Cushion | |
| — | H01-1250-03 | Case | 051 |
| — | H01-1264-03 | Case | 061 |
| — | H03-0373-04 | Carton case (external) | 051 |
| — | H03-0381-04 | Carton case (internal) | 061 |
| — | H10-1204-12 | Polystyrene foamed fixture | |
| — | H10-1205-04 | Polystyrene foamed plate | |
| — | H10-1206-14 | Buffer fixture | |
| — | H25-0049-03 | Polyethylene bag | |
| — | H25-0079-04 | Polyethylene bag | |
| — | H25-0103-03 | Polyethylene bag | |
| — | H25-0106-04 | Polyethylene bag | |
| — | J01-0021-04 | Leg | |
| — | J02-0058-04 | Leg (rubber) x 2 | |
| — | J13-0029-05 | Fuse holder | |
| — | J19-0356-05 | Diode holder x 2 | |
| — | J21-0448-04 | Speaker mounting fitting x 3 | |
| — | J21-0941-02 | Angle | |
| — | J32-0146-04 | Hexagonal boss x 4 | |
| — | J41-0020-04 | Knob bushing x 4 | |
| — | J51-0006-15 | Mounting bracket stopper x 2 | |
| — | J61-0019-05 | Cable wrapping band x 12 | |
| — | J29-0045-04 | Mounting bracket guide x 2 | |
| — | K20-0137-04 | Knob (outside) x 2 | |
| — | K21-0248-04 | Main knob | |
| — | K21-0284-04 | Knob (inside) x 2 | |
| — | K29-0200-04 | Knob (black) x 3 | |
| — | K29-0201-04 | Knob (red) | |
| — | T03-0027-15 | Speaker | |
| — | T91-0024-05 | Microphone (TRIO) | 051 |
| — | T91-0026-05 | Microphone (Kenwood) | 061 |
| — | X45-1040-00 | Final unit | |
| — | X50-1230-00 | Carrier unit | |
| — | X50-1240-00 | Synthesizer unit | |
| — | X51-1110-00 | Filter unit | |
| — | X55-1080-00 | RX unit | |

PARTS LIST

■ FINAL (X45-1040-00)

| Ref. No. | Parts No. | Description | | | Re-marks |
|----------------------|----------------|------------------|-------------------|------------|----------|
| CAPACITOR | | | | | |
| C1 | CC45SL2H070D | Ceramic | 7pF | ±0.5pF | |
| C2 | CC45SL2H150J | Ceramic | 15pF | ±5% | |
| C4 | CK18E2H102P | Ceramic | 0.001μF | +100%, -0% | |
| C6 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C7 | CK18E2H102P | Ceramic | 0.001μF | +100%, -0% | |
| C8 | CC45SL2H220J | Ceramic | 22pF | ±5% | |
| C9 | CC45SL2H470J | Ceramic | 47pF | ±5% | |
| C10 | C90-0215-05 | Ceramic | 100pF | ±10% | |
| C11 | CE04W1E100(RL) | Electrolytic | 10μF | 25WV | |
| C12 | CK45D1H102M | Ceramic | 0.001μF | ±20% | |
| C13 | CC45SL2H100J | Ceramic | 10pF | ±5% | |
| C14 | CE04W1A470(RL) | Electrolytic | 47μF | 10WV | |
| C15 | CK45D1H102M | Ceramic | 0.001μF | ±20% | |
| RESISTOR | | | | | |
| R1 | PD14BY2E470J | Carbon | 47Ω | ±5% | 1/4W |
| R2 | PD14BY2E331J | Carbon | 330Ω | ±5% | 1/4W |
| R4 | RC05GF2H221J | Carbon | 220Ω | ±5% | 1/2W |
| R5 | RC05GF2H121J | Carbon | 120Ω | ±5% | 1/2W |
| R6 | RC05GF2H100J | Carbon | 10Ω | ±5% | 1/2W |
| R7 | PD14BY2E101J | Carbon | 100Ω | ±5% | 1/4W |
| SEMICONDUCTOR | | | | | |
| Q1 | V03-0350-05 | Transistor | 2SC1169 | | |
| Q2 | V03-0349-05 | Transistor | 2SC1242A | | |
| Q3 | V04-0046-05 | Transistor | 2SD235 (Y) or (O) | | |
| D1, 2 | V11-0076-05 | Diode | 1S1555 | | |
| D3 | V11-0249-05 | Zener diode | WZ-120 | | |
| COIL | | | | | |
| L1 | L34-0426-05 | VHF coil | | | |
| L2 | L34-0005-05 | VHF coil | | | |
| L3 | L34-0427-05 | VHF coil | | | |
| L4 | L34-0411-05 | VHF coil | | | |
| L5 | L34-0426-05 | VHF coil | | | |
| TRIMMER | | | | | |
| TC1, 2 | C05-0013-15 | Ceramic trimmer | 20pF × 2 | | |
| TC3 | C05-0001-05 | Trimmer | 20pF | | |
| TC4 | C05-0002-05 | Trimmer | 40pF | | |
| MISCELLANEOUS | | | | | |
| — | E23-0015-04 | Earth lug | x 2 | | |
| — | E23-0048-04 | Terminal | | | |
| — | E23-0072-04 | Terminal (earth) | | | |
| — | F01-0158-03 | Heat sink | | | |
| — | F20-0028-05 | Shield plate | (for 2SD235) | | |
| — | J25-0916-03 | PC board | | | |
| — | J32-0029-04 | Hexagonal boss | | | |

■ CARRIER (X50-1230-00)

| Ref. No. | Parts No. | Description | | | Re-marks |
|------------------|----------------|--------------|---------|------------|----------|
| CAPACITOR | | | | | |
| C1, 2 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C3 | CQ93M1H104K | Mylar | 0.1μF | ±10% | |
| C4 | CK45D1H102M | Ceramic | 0.001μF | ±20% | |
| C5 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | |
| C6 | CE04W1A470(RL) | Electrolytic | 47μF | 10WV | |
| C7 | CE04W1H010(RL) | Electrolytic | 1μF | 50WV | |
| C8, 9 | CQ92M1H223K | Mylar | 0.022μF | ±10% | |
| C10 | CE04W1H010(RL) | Electrolytic | 1μF | 50WV | |
| C11 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | |
| C12 | CE04W1H010(RL) | Electrolytic | 1μF | 50WV | |
| C13 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C14, 15 | CK45D1H102M | Ceramic | 0.001μF | ±20% | |
| C16 | CC45CH1H470J | Ceramic | 47pF | ±5% | |
| C17 | CC45SL1H100J | Ceramic | 10pF | ±5% | |
| C18 | CE04W1A470(RL) | Electrolytic | 47μF | 10WV | |
| C19, 20 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C21 | CK45D1H102M | Ceramic | 0.001μF | ±20% | |
| C22, 23 | CC45SL1H221K | Ceramic | 220pF | ±10% | |
| C24, 25 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C26 | CE04W1C101(RL) | Electrolytic | 100μF | 16WV | |
| C27 | CC45CH1H050D | Ceramic | 5pF | ±0.5pF | |
| C28 | CC45CH1H330J | Ceramic | 33pF | ±5% | |
| C29 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C30 | CC45SL1H470J | Ceramic | 47pF | ±5% | |
| C31 | CC45SL1H101K | Ceramic | 100pF | ±10% | |
| C32, 33 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C34 | CE04W1HR47(RL) | Electrolytic | 0.47μF | 50WV | |
| C35 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C36 ~ 39 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | |
| C41 | CE04W1A470(RL) | Electrolytic | 47μF | 10WV | |
| C42 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -30% | |
| C43 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | |
| C44 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | |
| C46 | CC45CH1H050D | Ceramic | 5pF | ±0.5pF | |
| RESISTOR | | | | | |
| R1 | RD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W |
| R2 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W |
| R3 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W |
| R4 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W |
| R5 | PD14CY2E222J | Carbon | 2.2kΩ | ±5% | 1/4W |
| R6 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W |
| R7 | PD14CY2E154J | Carbon | 150kΩ | ±5% | 1/4W |
| R8 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W |
| R9, 10 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W |
| R11 | PD14CY2E331J | Carbon | 330Ω | ±5% | 1/4W |
| R12 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W |
| R13 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W |
| R14, 15 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W |
| R16 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W |
| R17 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W |
| R18, 19 | PD14CY2E473J | Carbon | 47kΩ | ±5% | 1/4W |
| R20 | PD14CY2E393J | Carbon | 39kΩ | ±5% | 1/4W |
| R21 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W |
| R22 | PD14CY2E182J | Carbon | 1.8kΩ | ±5% | 1/4W |
| R23 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W |
| R24 | PD14CY2E823J | Carbon | 82kΩ | ±5% | 1/4W |
| R25 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W |
| R26 | PD14CY2E152J | Carbon | 1.5kΩ | ±5% | 1/4W |

PARTS LIST

| Ref. No. | Parts No. | Description | Re-marks |
|----------------------|--------------|--------------------------------|----------|
| R27 | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W | |
| R28 | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W | |
| R29 | PD14CY2E471J | Carbon 470Ω ±5% 1/4W | |
| R30 | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W | |
| R31, 32 | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W | |
| R33 | PD14CY2E471J | Carbon 470Ω ±5% 1/4W | |
| R34 | PC05GF2H100J | Carbon 10Ω ±5% 1/4W | |
| R35 | PD14CY2E331J | Carbon 330Ω ±5% 1/4W | |
| R36 | PD14CY2E152J | Carbon 1.5kΩ ±5% 1/4W | |
| R37 | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W | |
| R38 | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W | |
| R39 | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W | |
| SEMICONDUCTOR | | | |
| Q1~3 | V03-0129-05 | Transistor 2SC733 (Y) | |
| Q4 | V03-0134-05 | Transistor 2SC371 (O) | |
| Q5 | V03-0079-05 | Transistor 2SC460 (B) | |
| Q6 | V03-0134-05 | Transistor 2SC371 (O) | |
| Q7 | V03-0241-05 | Transistor 2SC735 (Y, O) | |
| Q8 | V03-0123-05 | Transistor 2SC733 (Y, O) | |
| Q9 | V03-0336-05 | Transistor 2SC496 (Y, O) | |
| D1~4 | V11-0051-05 | Diode 1N60 | |
| D5 | V11-0076-05 | Diode 1S1555 | |
| D6, 7 | | Diode 1S1587 | |
| D8 | V11-0317-05 | Diode 1S2208 or 1S2206 | |
| D9 | V11-0270-05 | Diode U05B | |
| D10 ~ 13 | V11-0076-05 | Diode 1S1555 | |
| D14 | V11-0243-05 | Zener diode WZ-061 | |
| D15 | V11-0240-05 | Zener diode WZ-090 | |
| POTENTIOMETER | | | |
| VR1 | R12-2015-05 | Volume 5kΩ | |
| VR2 | R12-0048-05 | Volume 100Ω | |
| VR3, 4 | R12-3025-05 | Volume 10kΩ | |
| VR5 | R12-2015-05 | Volume 5kΩ | |
| COIL/TRIMMER | | | |
| L1, 2 | L40-1021-03 | Ferri-inductor 1mH | |
| L3 | L30-0005-05 | IFT | |
| L4 | L40-1021-03 | Ferri-inductor 1mH | |
| L5 | L30-0281-05 | IFT | |
| L6, 7 | L40-1021-03 | Ferri-inductor 1mH | |
| L8 | L12-0013-05 | Input transformer | |
| TC1, 2 | C05-0013-15 | Trimmer 20pF | |
| X'tal | | | |
| X1 | L77-0355-05 | Crystal oscillator 10.6985 MHz | |
| MISCELLANEOUS | | | |
| — | E23-0047-04 | Terminal | |
| — | F10-0348-14 | Shield plate | |
| — | J25-1102-13 | PC board | |

■ SYNTHESIZER (X50-1240-00)

| Ref. No. | Parts No. | Description | | | Re-marks |
|------------------|----------------|--------------------|------------|--|----------|
| CAPACITOR | | | | | |
| C1~12 | CC45SL1H220J | Ceramic 22pF | ±5% | | |
| C13 ~ 16 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C17 | CE04W1H010(RL) | Electrolytic 1μF | 50WV | | |
| C18 | CE04W1C100(RL) | Electrolytic 10μF | 16WV | | |
| C19 | CE04W1H010(RL) | Electrolytic 1μF | 50WV | | |
| C20 | CE04W1A470(RL) | Electrolytic 47μF | 10WV | | |
| C21 | CQ92M1H473K | Mylar 0.047μF | ±10% | | |
| C22 | CE04W1C101(RL) | Electrolytic 100μF | 16WV | | |
| C23, 24 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C25 | CE04W1C100(RL) | Electrolytic 10μF | 16WV | | |
| C26 | CE04W1A470(RL) | Electrolytic 47μF | 10WV | | |
| C27 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C28 | CK45D1H102M | Ceramic 0.001μF | ±20% | | |
| C29 | CC45CH1H070D | Ceramic 7pF | ±0.5pF | | |
| C30 | CK45D1H102M | Ceramic 0.001μF | ±20% | | |
| C31 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C32 | CC45CH1H330J | Ceramic 33pF | ±5% | | |
| C33 | CC45CH1H020C | Ceramic 2pF | ±0.25pF | | |
| C34 | CC45TH1H220J | Ceramic 22pF | ±5% | | |
| C35 | CK45F1H203Z | Ceramic 0.02μF | +80%, -20% | | |
| C36 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C37 | CC45SL1H101J | Ceramic 100pF | ±5% | | |
| C38 | CC45SL1H470J | Ceramic 47pF | ±5% | | |
| C39 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C40 | CC45CH1H100J | Ceramic 10pF | ±5% | | |
| C41 | CK45F1H103J | Ceramic 0.01μF | +80%, -20% | | |
| C42 | CC45SL1H020C | Ceramic 2pF | ±0.25pF | | |
| C43 | CC45CH1H030C | Ceramic 3pF | ±0.25pF | | |
| C44, 45 | CC45CH1H070D | Ceramic 7pF | ±0.5pF | | |
| C46 | CC45CH1H680J | Ceramic 68pF | ±5% | | |
| C47, 48 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C49 | CC45CH1H070D | Ceramic 7pF | ±0.5pF | | |
| C50 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C51 | CC45CH1H100J | Ceramic 10pF | ±5% | | |
| C52, 53 | C90-0231-05 | Ceramic 0.5pF | | | |
| C54~ 57 | CC45CH1H100J | Ceramic 10pF | ±5% | | |
| C58, 59 | CK45D1H102M | Ceramic 0.001μF | ±20% | | |
| C60 | CC45CH1H070D | Ceramic 7pF | ±0.5pF | | |
| C61 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C62, 63 | CC45CH1H100J | Ceramic 10pF | ±5% | | |
| C64, 65 | CK45D1H102M | Ceramic 0.001μF | ±20% | | |
| C66 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C67 | CC45SL1H221J | Ceramic 22pF | ±5% | | |
| C68 | CC45SL1H221J | Ceramic 220pF | ±5% | | |
| C69 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C70 | CC45CH1H030C | Ceramic 3pF | ±0.25pF | | |
| C71 | CC45CH1H390J | Ceramic 39pF | ±5% | | |
| C72 | CC45SL1H220J | Ceramic 22pF | ±5% | | |
| C73 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C74 | CC45SL1H100J | Ceramic 10pF | ±5% | | |
| C75, 76 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C77 | CC45SL1H101J | Ceramic 10pF | ±5% | | |
| C78 | CC45SL1H101J | Ceramic 100pF | ±5% | | |
| C79, 80 | CK45F1H103Z | Ceramic 0.01μF | +80%, -20% | | |
| C81 | CE04W1H010(RL) | Electrolytic 1μF | 50WV | | |
| C82, 83 | CK45F1H103Z | Ceramic 0.01μF | 50WV | | |
| C84 | CC45SL1H470J | Ceramic 47pF | ±5% | | |
| C85 | CK45F1H103J | Ceramic 0.01μF | +80%, -20% | | |

PARTS LIST

| Ref. No. | Parts No. | Description | | | Re-marks | Ref. No. | Parts No. | Description | | | Re-marks | | | | | | |
|-----------------|----------------|--------------|---------|------------|----------|----------------------|--------------|-------------------|----------------|-----|----------|--|--|--|--|--|--|
| C86 | CC45CH1H330J | Ceramic | 33pF | ±5% | | R58 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | | | | | | |
| C87, 83 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | R59 | PD14CY2E271J | Carbon | 270Ω | ±5% | 1/4W | | | | | | |
| C89 | CC45CH1H050D | Ceramic | 5pF | ±0.5pF | | R60 | PD14CY2E682J | Carbon | 6.8kΩ | ±5% | 1/4W | | | | | | |
| C90 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R61 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | | | | | | |
| C91 | CC45CH1H050D | Ceramic | 5pF | ±0.5pF | | R62 | PD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W | | | | | | |
| C92, 93 | C90-0231-05 | Ceramic | 0.5pF | | | R63 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | | | | | | |
| C94 ~ 96 | CC45CH1H070D | Ceramic | 7pF | ±0.5pF | | R64 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | | | | | | |
| C97 | CC45SL1H101J | Ceramic | 100pF | ±5% | | R65 | PD14CY2E272J | Carbon | 2.7kΩ | ±5% | 1/4W | | | | | | |
| C98 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | R66 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | | | | | | |
| C99 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R67 | PD14CY2E473J | Carbon | 47kΩ | ±5% | 1/4W | | | | | | |
| C100 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | R68 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | | | | | | |
| C101 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R69 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | | | | | | |
| C102 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | R71 | PD14CY2E222J | Carbon | 2.2kΩ | ±5% | 1/4W | | | | | | |
| C103 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R72 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | | | | | | |
| C104 | CC45SL1H070D | Ceramic | 7pF | ±0.5pF | | R73 | PD14CY2E561J | Carbon | 560Ω | ±5% | 1/4W | | | | | | |
| C105 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R74, 75 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | | | | | | |
| C106 | CC45SL1H270J | Ceramic | 27pF | ±5% | | R76 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | | | | | | |
| C107 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R77 | PD14CY2E562J | Carbon | 5.6kΩ | ±5% | 1/4W | | | | | | |
| C108 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | R80 | PD14CY2E100J | Carbon | 10Ω | ±5% | 1/4W | | | | | | |
| C109 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | R82 | PD14CY2E222J | Carbon | 2.2kΩ | ±5% | 1/4W | | | | | | |
| C110 | CC45SL1H100J | Ceramic | 10pF | ±5% | | R83 | PD14CY2E470J | Carbon | 47Ω | ±5% | 1/4W | | | | | | |
| C111 | CE04W1A470(RL) | Electrolytic | 47μF | 10WV | | R84 | PD14CY2E100J | Carbon | 10Ω | ±5% | 1/4W | | | | | | |
| C112 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | R85 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | | | | | | |
| RESISTOR | | | | | | | | | | | | | | | | | |
| R1~12 | PD14CY2E182J | Carbon | 1.8kΩ | ±5% | 1/4W | R86 | RC05GF2H6R8J | Carbon | 6.8Ω | ±5% | 1/2W | | | | | | |
| R13 ~ 16 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | R87 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | | | | | | |
| R17 | PD14CY2E333J | Carbon | 33kΩ | ±5% | 1/4W | R88 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | | | | | | |
| R18 | PD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W | R89 | PD14CY2E151J | Carbon | 150Ω | ±5% | 1/4W | | | | | | |
| R19 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | R90 | PD14CY2E330J | Carbon | 33Ω | ±5% | 1/4W | | | | | | |
| R20, 21 | PD14CY2E332J | Carbon | 3.3kΩ | ±5% | 1/4W | SEMICONDUCTOR | | | | | | | | | | | |
| R22 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | Q1 | V03-0125-05 | Transistor | 2SC734 (Y) | | | | | | | | |
| R23 | PD14CY2E153J | Carbon | 15kΩ | ±5% | 1/4W | Q2, 3 | V04-0046-05 | Transistor | 2SD235 (Y, O) | | | | | | | | |
| R24 | PD14CY2E820J | Carbon | 82Ω | ±5% | 1/4W | Q4 | V03-0336-05 | Transistor | 2SC496 (Y, O) | | | | | | | | |
| R25 | PD14CY2E220J | Carbon | 22Ω | ±5% | 1/4W | Q5, 6 | V03-0079-05 | Transistor | 2SC460 (B) | | | | | | | | |
| R26 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | Q7, 8 | V09-0012-05 | FET | 2SK19 (GR) | | | | | | | | |
| R27, 28 | PD14CY2E470J | Carbon | 47Ω | ±5% | 1/4W | Q9 | V09-0069-05 | FET | 3SK41 (L, M) | | | | | | | | |
| R29 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | Q10 ~ 12 | V03-0079-05 | Transistor | 2SC460 (B) | | | | | | | | |
| R30, 31 | RN92A3D010K | Metal plate | 1Ω | ±10% | 2W | Q13 | V09-0036-05 | FET | 3SK35 (GR, BL) | | | | | | | | |
| R32 | RC05GF2H100J | Carbon | 10Ω | ±5% | 1/2W | Q14, 15 | V09-0012-05 | FET | 2SK19 (GR) | | | | | | | | |
| R33 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | Q16 | V09-0069-05 | FET | 3SK41 (L, M) | | | | | | | | |
| R34 | PD14CY2E473J | Carbon | 47kΩ | ±5% | 1/4W | Q17 | V03-0168-05 | Transistor | 2SC998 | | | | | | | | |
| R35 | PD14CY2E562J | Carbon | 5.6kΩ | ±5% | 1/4W | Q18 | V03-0129-05 | Transistor | 2SC733 (Y) | | | | | | | | |
| R36 | PD14CY2E473J | Carbon | 47kΩ | ±5% | 1/4W | D1 ~ 18 | V11-0076-05 | Diode | 1S1555 | | | | | | | | |
| R37 | PD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W | D19 | V11-0317-05 | Diode | 1S2208 | | | | | | | | |
| R38 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | D20 | V11-0192-05 | Diode | 1S1658-1 | | | | | | | | |
| R39 | PD14CY2E561J | Carbon | 560Ω | ±5% | 1/4W | D21 | V11-0240-05 | Zener diode | WZ-090 | | | | | | | | |
| R40 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | D23, 24 | V11-0076-05 | Diode | 1S1587 | | | | | | | | |
| R41 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | D25 | V11-0076-05 | Diode | 1S1555 | | | | | | | | |
| R42 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | D26 | V11-0240-05 | Zener diode | WZ-090 | | | | | | | | |
| R43 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | POTENTIOMETER | | | | | | | | | | | |
| R44 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | VR1, 2 | R12-1020-05 | Volume | 1kΩ | | | | | | | | |
| R45, 46 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | VR3 | R12-3025-05 | Volume | 10kΩ | | | | | | | | |
| R47 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | COIL/TRIMMER | | | | | | | | | | | |
| R48 | PD14CY2E562J | Carbon | 5.6kΩ | ±5% | 1/4W | L1 ~ 4 | L31-0346-05 | Tuning coil | | | | | | | | | |
| R49 | PD14CY2E153J | Carbon | 15kΩ | ±5% | 1/4W | L5 | L40-2201-03 | Ferri-inductor | 22μH | | | | | | | | |
| R50 | PD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W | L6 | L34-0438-05 | Coil | 0.9μH | | | | | | | | |
| R51, 52 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | L7 | L40-1021-03 | Ferri-inductor | 1mH | | | | | | | | |
| R53 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | L8, 9 | L40-1005-44 | Ferri-inductor | 10μH | | | | | | | | |
| R55 | PD14CY2E152J | Carbon | 1.5Ω | ±5% | 1/4W | L10 | L12-0013-05 | Input transformer | | | | | | | | | |
| R56 | PD14CY2E153J | Carbon | 15kΩ | ±5% | 1/4W | L11 | L32-0002-05 | Tuning coil | | | | | | | | | |
| R57 | PD14CY2E473J | Carbon | 47kΩ | ±5% | 1/4W | L12, 13 | L31-0266-05 | Tuning coil | | | | | | | | | |

PARTS LIST

| Ref. No. | Parts No. | Description | Re-marks |
|---------------|-------------|-------------------------------|----------|
| L14 | L31-0313-05 | Tuning coil | |
| L15 | L31-0344-05 | Tuning coil | |
| L16 | L31-0180-05 | Tuning coil | |
| L17, 18 | L31-0267-05 | Tuning coil | |
| L19 | L31-0180-05 | Tuning coil | |
| L20 | L40-6891-02 | Ferri-inductor 6.8μH | |
| L21 | L40-1021-03 | Ferri-inductor 1mH | |
| L22 | L30-0005-05 | IFT | |
| L23 | L31-0313-05 | Tuning coil | |
| L24 | L31-0344-05 | Tuning coil | |
| L25 | L31-0180-05 | Tuning coil | |
| L26, 27 | L31-0267-05 | Tuning coil | |
| L28 | L33-0025-05 | Choke coil 1μH | |
| L29 | L34-0463-05 | VHF coil | |
| L30 | L34-0462-05 | VHF coil | |
| L31 | L34-0461-05 | VHF coil | |
| L32 | L34-0462-05 | VHF coil | |
| L33 | L40-1021-03 | Ferri-inductor 1mH | |
| TC1~12 | C05-0030-15 | Ceramic trimmer 20pF | |
| TC13 | C05-0031-15 | Ceramic trimmer 10pF | |
| TC14 | C05-0030-15 | Ceramic trimmer 20pF | |
| TC15, 16 | C05-0013-15 | Ceramic trimmer 20pF | |
| X'tal | | | |
| X1 | L77-0386-05 | Crystal oscillator 41.7005MHz | |
| X2 | L77-0387-05 | Crystal oscillator 41.7022MHz | |
| X3 | L77-0388-05 | Crystal oscillator 41.7038MHz | |
| X4 | L77-0389-05 | Crystal oscillator 41.7055MHz | |
| A1 | L77-0390-05 | Crystal oscillator 8.3000MHz | |
| A2 | L77-0391-05 | Crystal oscillator 8.3200MHz | |
| A3 | L77-0392-05 | Crystal oscillator 8.3400MHz | |
| A4 | L77-0393-05 | Crystal oscillator 8.3600MHz | |
| A5 | L77-0394-05 | Crystal oscillator 8.3800MHz | |
| B1 | L77-0395-05 | Crystal oscillator 8.4000MHz | |
| B2 | L77-0396-05 | Crystal oscillator 8.4200MHz | |
| B3 | L77-0397-05 | Crystal oscillator 8.4400MHz | |
| B4 | L77-0398-05 | Crystal oscillator 8.4600MHz | |
| B5 | L77-0399-05 | Crystal oscillator 8.4800MHz | |
| MISCELLANEOUS | | | |
| — | E18-0201-05 | Crystal socket | |
| — | E23-0046-04 | Terminal x 4 | |
| — | E23-0047-04 | Terminal x 42 | |
| — | F01-0150-14 | Heat sink | |
| — | F10-0347-04 | Shield plate (B) | |
| — | F10-0350-04 | Shield plate (D) | |
| — | F20-0078-05 | Insulator x 2 | |
| — | J25-1104-12 | PC board | |

| Ref. No. | Parts No. | Description | Re-marks |
|---------------|----------------|----------------------------|----------|
| C5, 6 | CC45SL2H220J | Ceramic 22pF ±5% | |
| C7 | CC45SL1H010C | Ceramic 1pF ±0.25pF | |
| C8 | CK45D1H102M | Ceramic 0.001μF ±20% | |
| C10 | CC45SL1H070D | Ceramic 7pF ±0.5pF | |
| C11 | CK45D1H102M | Ceramic 0.001μF ±20% | |
| C12 | CC45SL2H100J | Ceramic 10pF ±5% | |
| C13 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C14 | CK45D1H102M | Ceramic 0.001μF ±20% | |
| C16 ~ 18 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C19 | CE04W1C100(RL) | Electrolytic 10μF 16WV | |
| C20 | C90-0231-05 | Ceramic 0.5pF | |
| RESISTOR | | | |
| R1 | PD14CY2E221J | Carbon 220Ω ±5% 1/4W | |
| R2, 3 | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W | |
| SEMICONDUCTOR | | | |
| Q1 | V03-0123-05 | Transistor 2SC733 (Y or O) | |
| D1, 2 | V11-0255-05 | Diode M1301 | |
| D3 ~ 6 | V11-0051-05 | Diode 1N60 | |
| POTENTIOMETER | | | |
| VR1 | R12-4016-05 | Volume 50kΩ | |
| VR2 | R12-0042-05 | Volume 500Ω | |
| VR3 | R12-3025-05 | Volume 10kΩ | |
| COIL | | | |
| L1 | L40-1001-03 | Ferri-inductor 10μH | |
| L2 | L34-0387-05 | VHF coil | |
| L3, 4 | L34-0430-05 | VHF coil | |
| L5 | L40-1001-03 | Ferri-inductor 10μH | |
| L6 | L40-1021-03 | Ferri-inductor 1mH | |
| L7 | L39-0052-05 | Detecting coil | |
| MISCELLANEOUS | | | |
| — | E23-0046-04 | Terminal x 2 | |
| — | E23-0047-04 | Terminal x 8 | |
| — | J25-1101-14 | PC board | |

■ RX (X55-1080-00)

| Ref. No. | Parts No. | Description | Re-marks |
|-----------|--------------|--------------------------|----------|
| CAPACITOR | | | |
| C1 | CC45CH1H470J | Ceramic 47pF ±5% | |
| C2 | CC45RH1H100J | Ceramic 10pF ±5% | |
| C3 | CC45CH1H010C | Ceramic 1pF ±0.25pF | |
| C4 | CC45CH1H030C | Ceramic 3pF ±0.25pF | |
| C5 | CC45CH1H330J | Ceramic 33pF ±5% | |
| C6, 7 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C8 | CK45D1H102M | Ceramic 0.001μF ±20% | |
| C9 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C10 | C90-0018-05 | Ceramic 0.001μF ±20% | |
| C11 | CC45SL1H101K | Ceramic 100pF ±10% | |
| C12 | CC45CH1H330J | Ceramic 33pF ±5% | |
| C13 | CK45F1H103Z | Ceramic 0.01μF +80%,-20% | |
| C14 | CK45D1H102M | Ceramic 0.001μF ±20% | |

■ FILTER (X51-1110-00)

| Ref. No. | Parts No. | Description | Re-marks |
|-----------|--------------|----------------------|----------|
| CAPACITOR | | | |
| C1 | CC45SL1H470J | Ceramic 47pF ±5% | |
| C2 | CK45D1H102M | Ceramic 0.001μF ±20% | |
| C3 | CC45SL2H470J | Ceramic 47pF ±5% | |

PARTS LIST

| Ref. No. | Parts No. | Description | | | | Re-marks | Ref. No. | Parts No. | Description | | | | Re-marks |
|----------------------|----------------|---------------|---------|------------|------|----------|----------|--------------|-------------|-------|-----|------|----------|
| C15 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R6, 7 | PD14CY2E104J | Carbon | 100kΩ | ±5% | 1/4W | |
| C16 | CC45CH1H010C | Ceramic | 1pF | ±0.25pF | | | R8 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | |
| C17 | CQ92M1H223K | Mylar | 0.022μF | ±10% | | | R9 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | |
| C18 | CC45CH1H070D | Ceramic | 7pF | ±0.5pF | | | R10 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | |
| C19 ~ 21 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R11 | PD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W | |
| C22 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | | | R12 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | |
| C23 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | | R13 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | |
| C24 | CQ92M1H223K | Mylar | 0.022μF | ±10% | | | R14 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | |
| C25 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R15 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | |
| C26 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | | R16, 17 | PD14CY2E472J | Carbon | 4.7kΩ | ±5% | 1/4W | |
| C27 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | | | R18 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | |
| C28 | CK45D1H102M | Ceramic | 0.01μF | ±20% | | | R19 | PD14CY2E682J | Carbon | 6.8kΩ | ±5% | 1/4W | |
| C29 | CC45CH1H330J | Ceramic | 33pF | ±5% | | | R20 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | |
| C30, 31 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R21 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C32 | CC45SL1H470J | Ceramic | 47pF | ±5% | | | R22 | PD14CY2E152J | Carbon | 1.5kΩ | ±5% | 1/4W | |
| C33 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R23 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C34, 35 | CQ92M1H393K | Mylar | 0.039μF | ±10% | | | R24 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | |
| C36 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R25 | PD14CY2E182J | Carbon | 1.8kΩ | ±5% | 1/4W | |
| C37 | CC45SL1H470J | Ceramic | 47pF | ±5% | | | R26 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C38 ~ 40 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R28 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | |
| C41 | CQ92M1H223K | Mylar | 0.022μF | ±10% | | | R29 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | |
| C42, 43 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R30 | PD14CY2E472J | Carbon | 47kΩ | ±5% | 1/4W | |
| C44 | CQ92M1H223K | Mylar | 0.022μF | ±10% | | | R31 | PD14CY2E562J | Carbon | 5.6kΩ | ±5% | 1/4W | |
| C45 | CC45CH1H010C | Ceramic | 1pF | ±0.25pF | | | R32 | PD14CY2E474J | Carbon | 470kΩ | ±5% | 1/4W | |
| C46 | CK45D1H102M | Ceramic | 0.001μF | ±20% | | | R33 | PD14CY2E682J | Carbon | 6.8kΩ | ±5% | 1/4W | |
| C47, 48 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R34 | PD14CY2E393J | Carbon | 39kΩ | ±5% | 1/4W | |
| C49 | CK45B1H331K | Ceramic | 330pF | ±10% | | | R35 | PD14CY2E273J | Carbon | 27kΩ | ±5% | 1/4W | |
| C50 | CK45F1H203Z | Ceramic | 0.02μF | +80%, -20% | | | R36 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | |
| C51 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | | | R37 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C52 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R38 | PD14CY2E470J | Carbon | 47Ω | ±5% | 1/4W | |
| C53 | CE04W1H010(RL) | Electrolytic | 1μF | 50WV | | | R39 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | |
| C54 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R40 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C55 | CQ92M1H223K | Mylar | 0.022μF | ±10% | | | R41 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | |
| C56 | CC45CH1H050D | Ceramic | 5pF | ±0.5pF | | | R42 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | |
| C57 | CC45SL1H470J | Ceramic | 47pF | ±5% | | | R43, 44 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C58 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R45 | PD14CY2E333J | Carbon | 33kΩ | ±5% | 1/4W | |
| C59 | CE04W1H3R3(RL) | Electrolytic | 3.3μF | 50WV | | | R46 | PD14CY2E153J | Carbon | 15kΩ | ±5% | 1/4W | |
| C60, 61 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R47, 48 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | |
| C62 | CE04W1H4R7(RL) | Electrolytic | 4.7μF | 50WV | | | R49 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C63 | CK45F1H203Z | Ceramic | 0.02μF | +80%, -20% | | | R50 | PD14CY2E105J | Carbon | 1MΩ | ±5% | 1/4W | |
| C64 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R51 | PD14CY2E222J | Carbon | 2.2kΩ | ±5% | 1/4W | |
| C65, 66 | CQ92M1H393K | Mylar | 0.039μF | ±10% | | | R52 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C67 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R53 | PD14CY2E473J | Carbon | 47kΩ | ±5% | 1/4W | |
| C68, 69 | CC45CH1H330J | Ceramic | 33pF | ±5% | | | R54 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C70 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R55 | PD14CY2E154J | Carbon | 150kΩ | ±5% | 1/4W | |
| C71 | CQ92M1H103K | Mylar | 0.01μF | ±10% | | | R56 | PD14CY2E103J | Carbon | 10kΩ | ±5% | 1/4W | |
| C72 | CQ92M1H473K | Mylar | 0.047μF | ±10% | | | R58 | PD14CY2E221J | Carbon | 220Ω | ±5% | 1/4W | |
| C73 | CE04W1H010(RL) | Electrolytic | 1μF | 50WV | | | R59 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | |
| C74 | CE04W1C100(RL) | Electrolytic | 10μF | 16WV | | | R60 | PD14CY2E223J | Carbon | 22kΩ | ±5% | 1/4W | |
| C75 | CE04W1A470(RL) | Electrolytic | 47μF | 10WV | | | R61 | PD14CY2E562J | Carbon | 5.6kΩ | ±5% | 1/4W | |
| C76 | CE04W1H010(RL) | Electrolytic | 1μ | 50WV | | | R62 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | |
| C77 | CK45F1H203Z | Ceramic | 0.002μF | +80%, -20% | | | R63 | PD14CY2E102J | Carbon | 1kΩ | ±5% | 1/4W | |
| C78, 79 | CK45F1H103Z | Ceramic | 0.01μF | +80%, -20% | | | R64 | PD14CY2E222J | Carbon | 2.2kΩ | ±5% | 1/4W | |
| C80 | CE04W1H010(RL) | Electrolytic | 1μF | 50WV | | | R65 | RC05GF2H680J | Carbon | 68Ω | ±5% | 1/2W | |
| C81 | CQ92M1H223K | Mylar | 0.022μF | ±10% | | | R66 | PD14CY2E182J | Carbon | 1.8kΩ | ±5% | 1/4W | |
| RESISTOR | | | | | | | | | | | | | |
| R1 | PD14CY2E104J | Carbon | 100kΩ | ±5% | 1/4W | | R67 | PD14CY2E471J | Carbon | 470Ω | ±5% | 1/4W | |
| R2 | PD14CY2E332J | Carbon | 3.3kΩ | ±5% | 1/4W | | R68 | PD14CY2E224J | Carbon | 220kΩ | ±5% | 1/4W | |
| R3 | PD14CY2E474J | Carbon | 470kΩ | ±5% | 1/4W | | R69 | PD14CY2E470J | Carbon | 47Ω | ±5% | 1/4W | |
| R4, 5 | PD14CY2E101J | Carbon | 100Ω | ±5% | 1/4W | | R70 | PD14CY2E153J | Carbon | 15kΩ | ±5% | 1/4W | |
| SEMICONDUCTOR | | | | | | | | | | | | | |
| Q1 | V09-0057-05 | FET 3SK41 (L) | | | | | | | | | | | |

PARTS LIST

| Ref. No. | Parts No. | Description | Re-marks | Ref. No. | Parts No. | Description | Re-marks |
|----------------------|-------------|--------------------------|----------|----------|-----------|-------------|----------|
| Q2 | V09-0036-05 | FET 3SK35 (GR) | | | | | |
| Q3, 4 | V03-0079-05 | Transistor 2SC460 (B) | | | | | |
| Q5 | V09-0036-05 | FET 3SK35 (GR) | | | | | |
| Q6 | V09-0012-05 | FET 2SK19 (GR) | | | | | |
| Q7 | V03-0214-05 | Transistor 2SA495 (Y, O) | | | | | |
| Q8 | V03-0094-05 | Transistor 2SC458 (B) | | | | | |
| Q9 | V03-0079-05 | Transistor 2SC460 (B) | | | | | |
| Q10, 11 | V03-0123-05 | Transistor 2SC733 (Y, O) | | | | | |
| Q12 | V03-0094-05 | Transistor 2SC458 (B) | | | | | |
| Q13 | V03-0123-05 | Transistor 2SC733 (Y, O) | | | | | |
| Q14 | V09-0036-05 | FET 3SK35 (GR) | | | | | |
| Q15 | V03-0129-05 | Transistor 2SC733 (Y) | | | | | |
| D1 ~ 7 | V11-0056-05 | Diode 1S1587 | | | | | |
| D8 ~ 11 | V11-0051-05 | Diode 1N60 | | | | | |
| D12 | V11-0076-05 | Diode 1S1555 | | | | | |
| D13 | V11-0240-05 | Zener diode WZ-090 | | | | | |
| D14 ~ 20 | V11-0051-05 | Diode 1N60 | | | | | |
| POTENTIOMETER | | | | | | | |
| VR1 | R12-7013-05 | Volume 50kΩ | | | | | |
| VR2, 3 | R12-1020-05 | Volume 1kΩ | | | | | |
| VR4 | R12-0042-05 | Volume 500Ω | | | | | |
| COIL/TRIMMER | | | | | | | |
| L1 | L31-0266-05 | Tuning coil | | | | | |
| L2 | L31-0267-05 | ANT coil | | | | | |
| L3 | L34-0390-05 | VHF coil (B) | | | | | |
| L4 | L34-0389-05 | VHF coil (A) | | | | | |
| L5 | L34-0390-05 | VHF coil (B) | | | | | |
| L6 | L30-0005-05 | IFT | | | | | |
| L7 | L71-0021-05 | Crystal filter | | | | | |
| L8 | L30-0005-05 | IFT | | | | | |
| L9 ~ 11 | L40-1021-03 | Ferri-inductor 1mH | | | | | |
| L12 | L71-0022-05 | Crystal filter | | | | | |
| L13, 14 | L40-1021-03 | Ferri-inductor 1mH | | | | | |
| L15 ~ 18 | L30-0005-05 | IFT | | | | | |
| L19 | L40-1021-03 | Ferri-inductor 1mH | | | | | |
| L20 | L40-1092-03 | Ferri-inductor 1mH | | | | | |
| L21 | L40-1021-03 | Ferri-inductor 1mH | | | | | |
| L22 | L33-0005-05 | IFT | | | | | |
| L23 ~ 25 | L40-1021-03 | Ferri-inductor 1mH | | | | | |
| TC1 ~ 3 | C05-0039-05 | Ceramic trimmer 6pF | | | | | |
| MISCELLANEOUS | | | | | | | |
| — | E23-0046-04 | Terminal x 3 | | | | | |
| — | E23-0047-04 | Terminal x 24 | | | | | |
| — | E23-0055-05 | Hermetic seal | | | | | |
| — | F11-0156-04 | Shield case | | | | | |
| — | J25-1103-03 | PC board | | | | | |

TROUBLESHOOTING

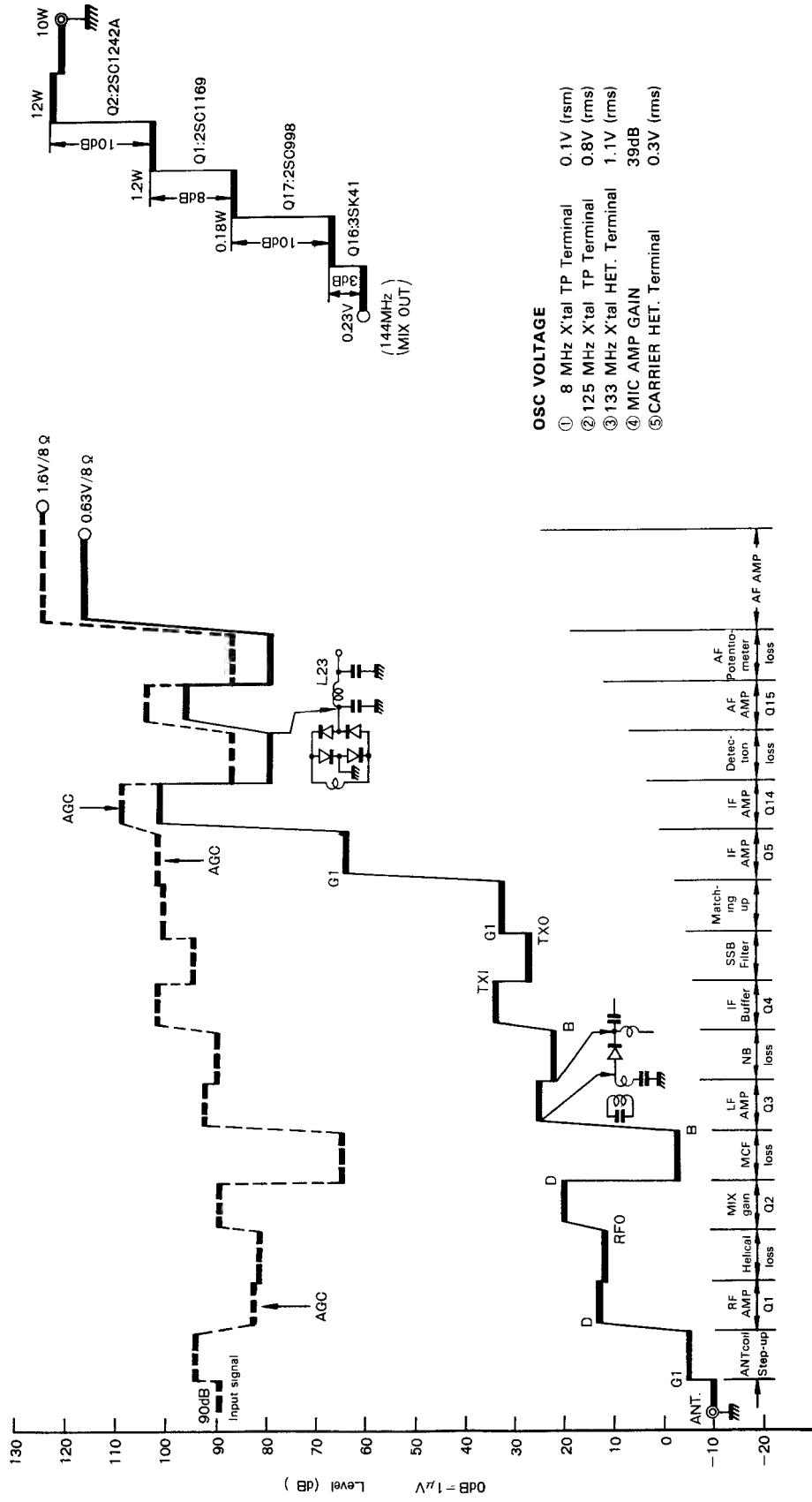
| TROUBLE | PROBABLE CAUSE | | REMEDY |
|--|---|---|---|
| 1. Power is not supplied | 1) Fuse 2) Power cord 3) Power switch | <input type="radio"/> Fuse blown <input type="radio"/> Capacity insufficient <input type="radio"/> Plug connection faulty <input type="radio"/> Power switch defective | Check fuse and replace it, if faulty Replace with fuse of 4A Repair plug connection, if faulty Repair power switch, if defective |
| 2. Fuse is blown (during reception) (during transmission) | 1) Power supply 2) B circuit 3) AF final stage 1) Final unit | <input type="radio"/> Polarity reversed <input type="radio"/> D9 (U05B) faulty <input type="radio"/> Q7 (2SC735) faulty <input type="radio"/> Q2 or Q3 (2SD235) faulty <input type="radio"/> Q2 (2SC1242A) faulty | Change polarity Replace D9, if defective Replace Q7, if defective Replace Q2 or Q3, if defective Replace Q2, if defective |
| 3. No signal is received at all (Even noise is not heard) (Noise is heard) (S meter operates) | 1) AF final stage 2) Speaker cord 3) AF VR 1) Synthesizer unit 2) IF circuit 3) Carrier unit | <input type="radio"/> Q2 or Q3 (2SD235) faulty <input type="radio"/> Broken wire <input type="radio"/> Poor contact <input type="radio"/> No oscillation <input type="radio"/> Coil not properly adjusted <input type="radio"/> No oscillation | Check voltage against rating Repair speaker cord, if defective Repair contact, if poor Check oscillator voltage against rating Adjust coil properly Check oscillator voltage against rating |
| 4. Sensitivity is too low (S meter operates) | 1) RF circuit 2) Synthesizer unit 3) IF circuit 4) Carrier unit | <input type="radio"/> Q1 (3SD41) faulty <input type="radio"/> Helical part not properly adjusted <input type="radio"/> RF coil not properly adjusted <input type="radio"/> Output level too low <input type="radio"/> Coil not properly adjusted <input type="radio"/> Filter (L7, L12) faulty <input type="radio"/> Carrier output too low | Check voltage against rating Adjust helical part properly Adjust RF coil properly Check voltage and adjust it properly Adjust coil properly Replace filter, if defective Adjust carrier output properly |
| 5. S meter does not operate | 1) Sensitivity 2) RX unit 3) RX unit | <input type="radio"/> Refer to Step 4 above <input type="radio"/> VR1, VR2 or VR4 not properly adjusted <input type="radio"/> AGC circuit faulty | Adjust VR1, VR2 or VR4 properly Repair AGC circuit, if faulty |
| 6. Sound is distorted | 1) AF final stage 2) RX unit 3) Carrier unit | <input type="radio"/> Q2 or Q3 (2SD235) faulty <input type="radio"/> Coil not properly adjusted <input type="radio"/> Frequency misaligned or output too low | Replace Q2 or Q3, if defective Adjust coil properly Adjust frequency or output properly |
| 7. NB does not operate | 1) NB unit | <input type="radio"/> L17 or L18 not properly adjusted | Adjust L17 or L18 properly |
| 8. RIT does not function properly (ON-OFF switch does not operate properly) | 1) Carrier unit VR3 | <input type="radio"/> VR3 not properly adjusted | Adjust VR3 properly |

TROUBLESHOOTING

| TROUBLE | PROBABLE CAUSE | | REMEDY |
|--|---|--|--|
| 9. CW output is zero (in all channels) (Individual channel) | 1) Synthesizer unit | <input type="radio"/> No oscillation at 41MHz <input type="radio"/> No oscillation | Adjust oscillator properly Adjust oscillator properly |
| | 2) Carrier unit 3) Final unit 1) Synthesizer unit | <input type="radio"/> Q1 or Q2 faulty <input type="radio"/> Crystal faulty | Replace Q1 or Q2, if defective Replace crystal, if defective |
| 10. CW output is too low | 2) Protection circuit | <input type="radio"/> Improper matching <input type="radio"/> Improper adjustment | Measure SWR Adjust protection circuit properly |
| | 3) Final unit | <input type="radio"/> Q1 or Q2 faulty | Replace Q1 or Q2, if defective |
| | 4) Synthesizer unit | <input type="radio"/> TC1 ~ TC4 not properly adjusted <input type="radio"/> Heterodyne action not properly adjusted | Adjust properly |
| | 5) Filter unit | <input type="radio"/> RF amplifier not properly adjusted <input type="radio"/> ALC (VR3) not properly adjusted | Adjust properly Adjust properly |
| | 1) Microphone | <input type="radio"/> Plug connection faulty <input type="radio"/> Microphone element faulty <input type="radio"/> Microphone amplifier faulty | Check plug connection for broken wire, and repair, if faulty Replace microphone element, if defective |
| 11. SSB output is zero | 2) Carrier unit | <input type="radio"/> Q5 or Q6 faulty | Repair Replace Q5 or Q6, if defective |
| | 1) Carrier unit | <input type="radio"/> Balanced modulating circuit TC1 not properly adjusted <input type="radio"/> VR2 not properly adjusted | Adjust properly Adjust properly |
| 12. Carrier leaks | 1) Filter unit | <input type="radio"/> VR1 not properly adjusted | Adjust properly |
| | 2) RX unit | <input type="radio"/> D9 faulty | Replace D9, if defective |
| 13. RF meter reading is too small or too large | | | |

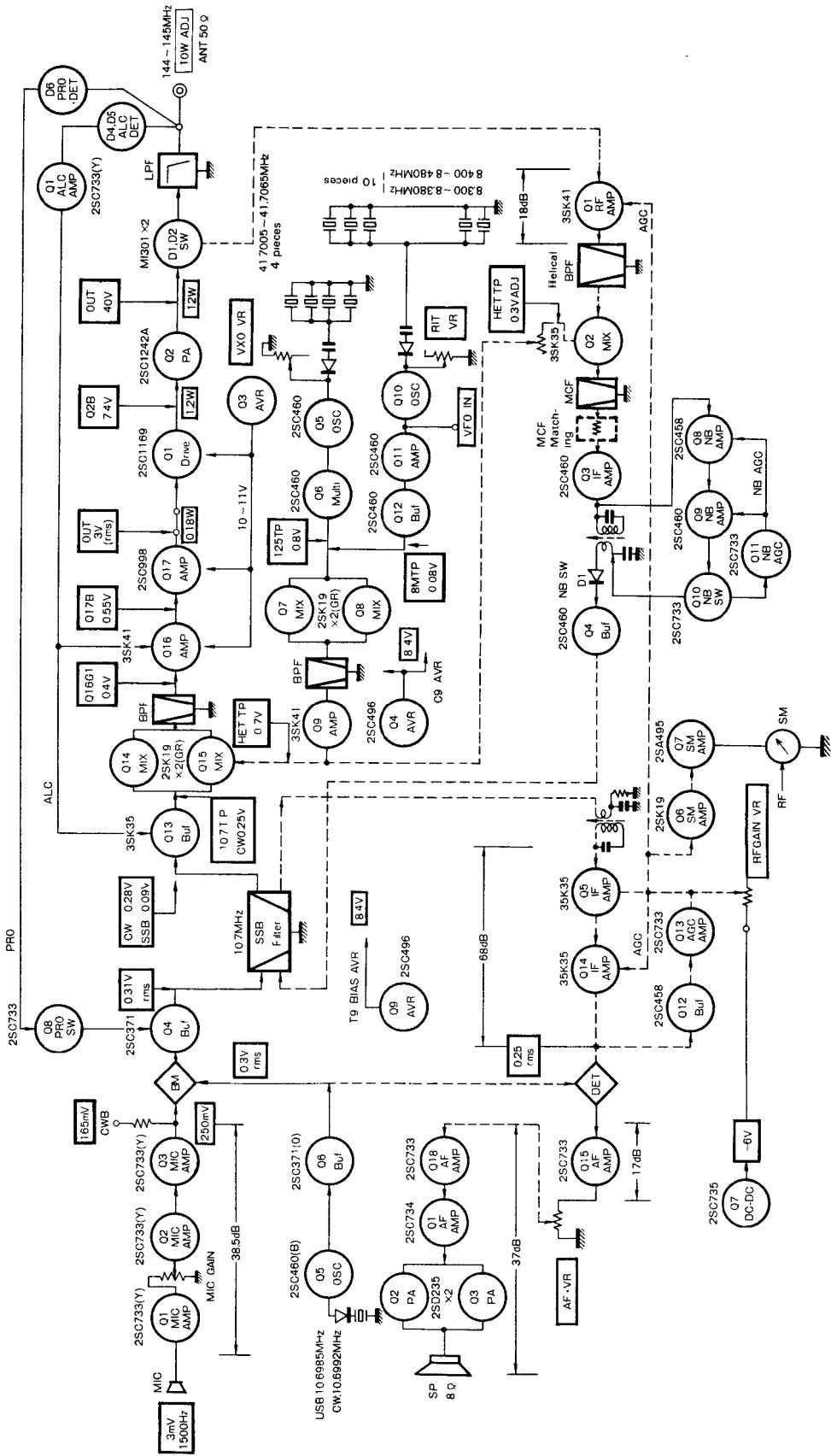
LEVEL DIAGRAM

TRANSMITTING POWER SECTION



TR-7010 RECEIVING SECTION

LEVEL DIAGRAM



ADJUSTMENTS

TEST EQUIPMENT

1. Frequency Counter

Minimum input voltage: 50mV or less
Frequency range: 200MHz or more

2. RF VTVM

Input impedance: More than $1M\Omega$, less than $20pF$
Voltage range: 10mV ~ 300V Full scale
Frequency range: More than 200MHz

3. Power Meter

50Ω , 20 ~ 30W, frequency range up to 144MHz or more

4. Standard Signal Generator

Frequencies generated: 144MHz band

5. Oscilloscope

High sensitivity oscilloscope capable of external synchronization

6. Sweep Generator

144MHz band

7. Marker

Oscillating frequency: 144, 145 and 146MHz

8. AF Generator

Frequency range: 300Hz ~ 5kHz
Output: 1V max.

9. AF VTVM

Frequency range: 50Hz ~ 10kHz
Input resistance: More than $1M\Omega$
Voltage range: 10mV ~ 30V Full scale

10. DC Power Supply

Voltage: 9V ~ 16V
Current: More than 3.5A

11. Ampere Meter

DC 0 ~ 4A

12. Voltmeter

DC 0 ~ 3V (high internal resistance). Tester may be used.

13. Noise Generator

14. Others

AF dummy load, $8\Omega/3W$
CW key
Detector

1. Adjustment of 8MHz X'tal Frequency

A. Setting positions of knobs on panel

- (1) RIT volume: Center
- (2) Receiving

B. Adjustment

- (1) Connect frequency counter to TP terminal on the synthesizer unit (see Fig. 1 and Fig. 2).
- (2) Set VFO-SYNTHESIZER selector switch on the rear of the case to SYNTHESIZER position and RIT switch to ON.
- (3) Set channel indicator to "80" and BAND switch to "144.2".
- (4) Set TC11 to the center position and adjust TC13 for 8.4800MHz. If this adjustment is difficult, set TC13 as close to 8.4800MHz as possible and then adjust TC11 for 8.4800MHz.

Adjust frequencies in the order given in Table 1.
NOTE: Each frequency should be adjusted within $\pm 100\text{Hz}$.

TR-7010

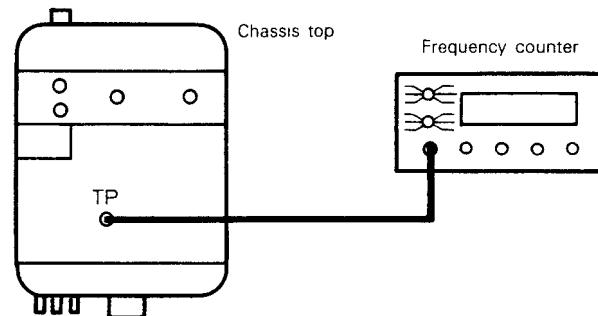


FIG. 1 ADJUSTMENT OF 8MHz FREQUENCIES

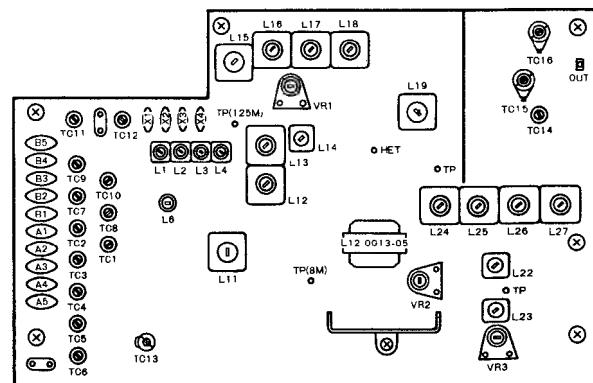


FIG. 2 SYNTHESIZER UNIT

ADJUSTMENTS

| Channel Indication | Frequency for Adjustment | Adjusting Trimmer | Operating Frequency |
|------------------------------------|--------------------------|-------------------|---------------------|
| Band Switch Position: 144.2 | | | |
| 60 | 8.4600MHz | TC10 | 144.260MHz |
| 40 | 8.4400MHz | TC9 | 144.240MHz |
| 20 | 8.4200MHz | TC8 | 144.220MHz |
| 00 | 8.4000MHz | TC7 | 144.200MHz |
| Band Switch Position: 144.1 | | | |
| 00 | 8.3000MHz | TC1 | 144.100MHz |
| 20 | 8.3200MHz | TC2 | 144.120MHz |
| 40 | 8.3400MHz | TC3 | 144.140MHz |
| 60 | 8.3600MHz | TC4 | 144.160MHz |
| 80 | 8.3800MHz | TC5 | 144.180MHz |

TABLE 1 ADJUSTING POINTS FOR 8MHz FREQUENCIES

- (4) With the frequency set to 144.100, turning the RIT volume fully clockwise and counterclockwise from its center position, confirm that the frequency is varied more than $\pm 1.5\text{kHz}$. Less than 8.2985MHz \leftrightarrow More than 8.3015MHz
- (5) Frequency adjustment at RIT OFF
With the RIT switch set to OFF and the frequency to 144.100MHz, adjust VR3 in the carrier unit (Fig. 3) for 8.3000MHz.
Check points:
 - 1) The frequency should not be varied when the RIT switch is turned to ON and OFF.
 - 2) The frequency should be varied every 4 positions of the rotary switch.

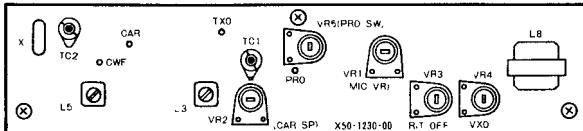


FIG. 3 CARRIER UNIT

2. 41MHz Oscillation Adjustment

A. Setting positions of knobs on panel

- (1) Receiving
- (2) RIT volume: Center
- (3) VXO volume: Center

B. Adjustment

- (1) Set the VFO-SYNTHESIZER selector switch to SYNTHESIZER position. Set the channel indicator to "00" and the BAND switch to "144.1".
- (2) Connect the frequency counter to the TP terminal on the synthesizer unit (see Fig. 2 and Fig. 4).
- (3) Turn the core of L11 in the synthesizer unit counterclockwise to confirm the starting point of oscillation.

Adjust the core so that the frequency counter counts the frequencies properly in the vicinity of 125.1015MHz.

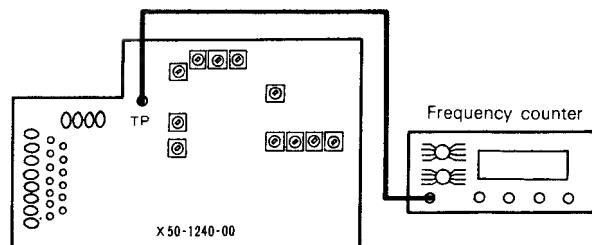


FIG. 4 41MHz OSCILLATION ADJUSTMENT

3. VXO Frequency Adjustment

A. Setting positions of knobs on panel

- (1) Receiving
- (2) VXO volume: Center

B. Adjustment

- (1) Connect the frequency counter to the TP terminal on the synthesizer unit (see Fig. 2 and Fig. 4).
- (2) Set the VFO-SYNTHESIZER selector switch to SYNTHESIZER position and the channel indicator to "00".
- (3) Adjust L1 ~ L4 so that the frequency counter indicates as shown in Table 2.

| Channel Indicator | Frequency for Adjustment | Adjusting Coil |
|-------------------|--------------------------|----------------|
| 00 | 125.1015MHz | L1 |
| 05 | 125.1065MHz | L2 |
| 10 | 125.1115MHz | L3 |
| 15 | 125.1165MHz | L4 |

TABLE 2 VXO FREQUENCY ADJUSTING POINTS

NOTE: If the cores of L1 ~ L4 are too much out of the center position during adjustment, set them to the center position and then adjust the frequency using L11 (readjustment should be made from 41MHz Oscillation Adjustment under the item 2).

C. VXO operation check

With the channel indicator set back to "00", turning the VXO volume fully clockwise and counterclockwise from its center position, confirm that the frequency is varied more than $\pm 2.5\text{kHz}$. Less than 125.0990 MHz \leftrightarrow More than 125.1040 MHz.

- (5) Set the VFO-SYNTHESIZER selector switch on the rear of the case to "VFO" with the channel indicator remaining in "00". Adjust VR4 on the carrier unit (Fig. 3) for 125.1015MHz.

ADJUSTMENTS

Check Points:

- 1) The frequency should be varied every 4 positions of the rotary switch.
- 2) The adjusting frequency should be within $\pm 300\text{Hz}$.

4. Carrier Oscillation Frequency Adjustment

A. Setting positions of knobs on panel

Any position

B. Adjustment

- (1) Connect RF VTVM to CAR terminal on the carrier unit (see Fig. 3 and Fig. 5).

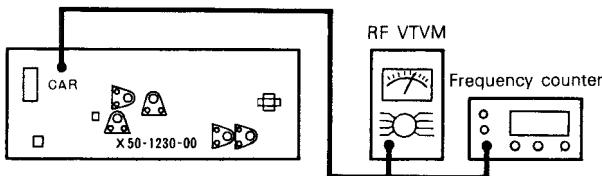


FIG. 5 CARRIER OSCILLATION ADJUSTMENT

- (2) Adjust L5 for maximum reading on RF VTVM.
- (3) Adjustment of SSB carrier oscillation frequency:
Remove RF VTVM and connect the frequency counter to CAR terminal on the carrier unit (Fig. 5). Adjust TC2 for 10.6985MHz.
- (4) Adjustment of CW carrier oscillation frequency:
Under the transmit mode, set CW/SSB switch to "CW" (press down) and adjust VR3 on the synthesizer unit (Fig. 2) for 10.6992MHz.

5. HET Adjustment (Important)

A. Setting positions of knobs on panel

CW/SSB switch: SSB (OFF) position

BAND switch: 144.2MHz position

Channel indicator: "95"

VFO-SYNTHESIZER selector switch (on the rear of case):

SYNTHESIZER position

B. Adjustment

- (1) Insert the adjusting crystal (8.900MHz) into the crystal socket on the synthesizer unit (Fig. 6).

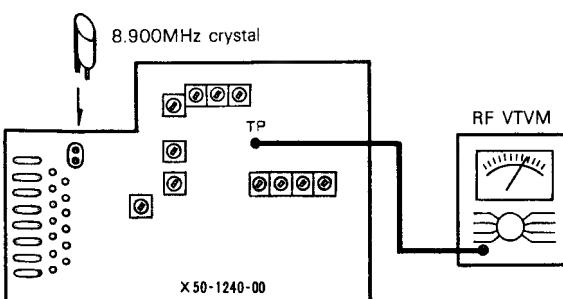
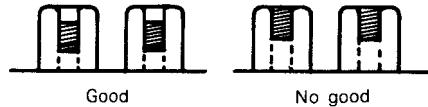


FIG. 6 HET ADJUSTMENT

- (2) Connect RF VTVM (1V range) to the TP terminal (Fig. 6).
- (3) Under the transmit mode, obtain a maximum reading on RF VTVM by adjusting L12 → L13 → L15 → L16 → L17 → L18 → L19 (f: 144.295MHz). This adjustment should be made several times.

NOTE: L12 and L13 should be tuned at the inner position as shown in the illustration below.



- (4) Set the channel indicator from "95" (144.295MHz) to "A" (144.70MHz) and adjust L14 for maximum reading on RF VTVM.
- (5) With the channel indicator set back to "95", obtain a maximum reading on RF VTVM by adjusting L12, L13, L15, L16, L17, L18 and L19 (RF VTVM may indicate a variation of 0.4 ~ 0.8V rms)

6. Adjustments of 10.7MHz and 144MHz

A. Setting positions of knobs on panel

CW/SSB switch: CW(ON) position

Frequency: 144.295MHz

VFO-SYNTHESIZER selector switch (on rear of case):

SYNTHESIZER position

Others: Any position

B. Adjustment

- (1) Remove the press-fitted lead from the OUT terminal on the synthesizer unit.
- (2) Connect RF VTVM to the TP terminal on the synthesizer unit (Fig. 7).
- (3) Set into transmitting
- (4) Obtain a maximum reading on RF VTVM by adjusting L3 on the carrier unit (Fig. 3) and L22 and L23 on the synthesizer unit (Fig. 2). The reading should be about 0.25V rms at 0.3V range.
- (5) Next, connect RF VTVM (3V range) to the OUT terminal (Fig. 7) on the synthesizer unit and then set TC16 to 1/2 in capacitance.
- (6) Obtain a maximum reading on RF VTVM by adjusting L24, L25, L26 and L27. Also adjust TC14 and TC15 for maximum reading.

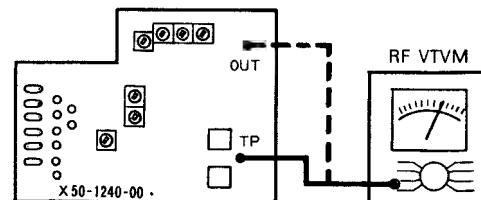


FIG. 7 ADJUSTMENT OF HF AMPLIFIER

ADJUSTMENTS

7. Power Adjustment

A. Setting positions of knobs on panel

Same as the item 6 above.

B. Adjustment

- (1) Connect the power meter to the ANT terminal and the press-fitted lead (removed under the item 6) to the OUT terminal. Set VR3 on the filter unit (Fig. 8) and VR5 on the carrier unit (Fig. 3) to minimum and then connect the ampere meter (DC 0 ~ 4A) to the power supply (Fig. 9).

NOTE: The ampere meter equipped with the DC power supply may be used.

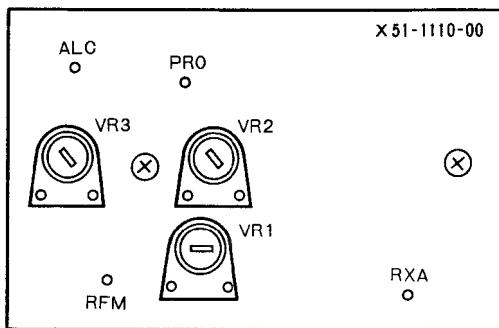


FIG. 8 FILTER UNIT

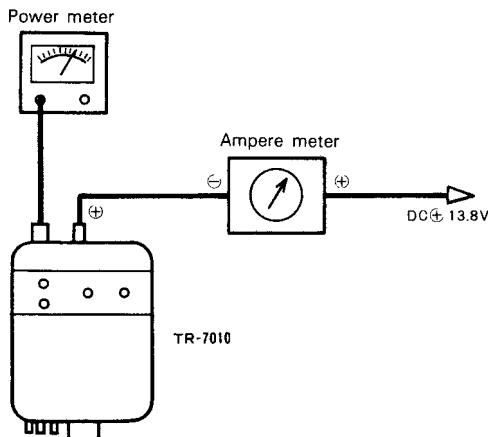


FIG. 9 CONNECTION OF AMPERE METER

- (2) Adjust TC1 on the final unit (Fig. 10) for maximum current. Then, adjust TC16 on the synthesizer unit (Fig. 2) for maximum output.

NOTE: Adjustments should be made in the above mentioned order.

- (3) Obtain a maximum output by adjusting TC2, TC3 and TC4 on the final unit (Fig. 10). Be sure that TC4 is turned in the direction where the current is decreased while the output remains unchanged.

This adjustment should be made carefully because it largely relates to spurious radiation.

NOTE: The power meter may indicate a variation of 12W ± 1W.

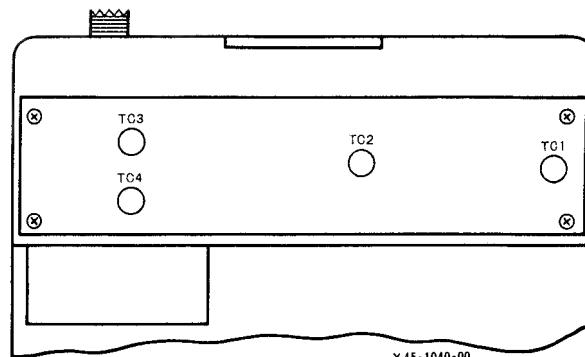


FIG. 10 PA UNIT

8. ALC Adjustment

Remaining the condition of item 7, proceed as follows:

- (4) Adjust VR3 on the filter unit (Fig. 8) until the transmit output reaches 10W.

9. Adjustment of RF Meter Indication

Remaining the condition of the item 8, proceed as follows:

- (5) Adjust VR1 on the filter unit so that the S meter indicates the "9" position on the scale ("8" position on RF scale).

10. Protection Adjustment

Remaining the condition of the item 9, proceed as follows:

- (6) Connect the voltmeter (DC 3V range) to the PRO terminal on the filter unit (Fig. 8).
- (7) Precisely adjust VR2 on the filter unit for minimum reading on the voltmeter.
- (8) Remove the power meter from the ANT terminal and adjust VR5 on the carrier unit (Fig. 3) so that the meter indicates the RF "5" (upper section of the figure "5").

11. Adjustment of Carrier Suppression

A. Setting positions of knobs on panel

CW/SSB switch: SSB position (OFF condition)

Channel indicator: "95" position

BAND switch: 144.2 position

VFO-SYNTHESIZER selector switch: SYNTHESIZER position

Others: Any position

B. Adjustment

- (1) Connect the power meter to the ANT terminal. Connect RF VTVM (0.3V range) to the ANT terminal of the filter unit (Fig. 11).
- (2) Short the MIC terminals "2" and "4" to set into transmitting.
- (3) Adjust alternately VR2 and TC1 on the carrier unit (Fig. 3) for minimum reading on RF VTVM. This adjustment should be repeated two or three times.

ADJUSTMENTS

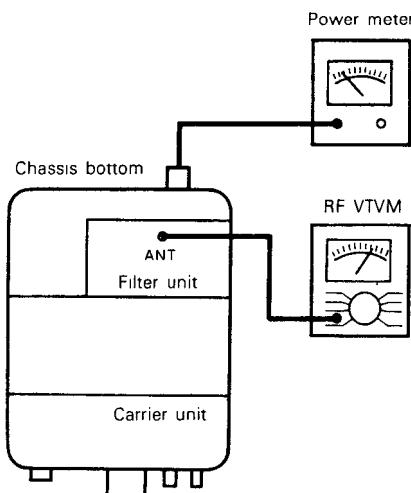


FIG. 11 ADJUSTMENT OF CARRIER SUPPRESSION

12. SSB Power Adjustment

After the adjustment under the item 11 above, proceed as follows:

- (4) Remove RF VTVM and connect the audio generator (AG) to the MIC terminal. Set the generator output to 3mV/600Ω, 1,500Hz.
- (5) Under the transmitting, adjust VR1 on the carrier unit (Fig. 3) until the power meter indicates 9W.
NOTE: Before readjusting the final unit, be sure to set ALC to OFF (turn VR3 on the filter unit fully clockwise).

13. Readjustment of Heterodyne Coil (L14)

- (1) Remove all the measuring instruments, except for the power cord (receiving). Set the channel to "A" and insert the adjusting crystal (8.9MHz for 144.70MHz) into the crystal socket (Fig. 6).
- (2) Connect RF VTVM to the 8MHz TP terminal (Fig. 2) on the synthesizer unit and then adjust L14 for maximum reading on RF VTVM.

14. Helical Adjustment

A. Setting positions of knobs on panel

Receiving

Channel indicator: "00"

BAND switch: 144.2MHz position

RF GAIN volume: Fully clockwise (MAX)

VFO-SYNTHESIZER selector switch: SYNTHESIZER position

Antenna terminal: Unconnected

NB switch: ON position

Others: Any position

B. Adjustment

- (1) Adjustment setup is shown in Fig. 12.

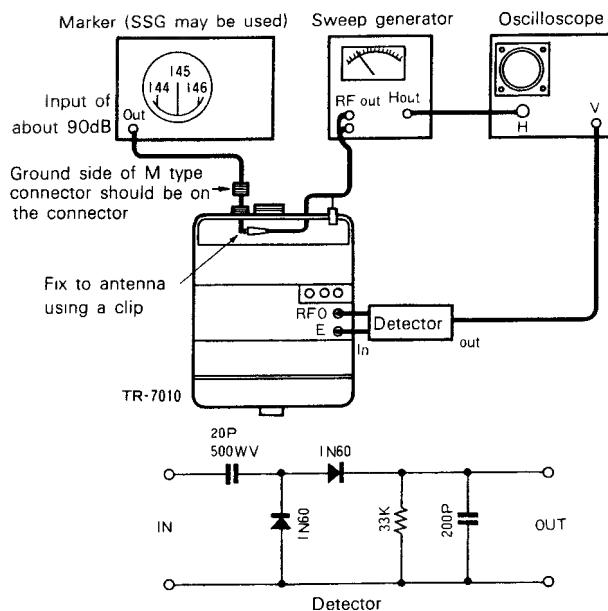


FIG. 12 HELICAL ADJUSTMENT

- (2) Turn the power switch to ON (power voltage: 13.8V).
- (3) Produce 144MHz marker signal (Fig. 13) and adjust TC2 and TC1 for maximum gain.
- (4) After the maximum gain is obtained, turn TC3 just about 1 rotation so that the gain is decreased.

NOTE: Since the frequency band of this unit is 144 ~ 145MHz, only the 144MHz marker signal is enough for the adjustment.

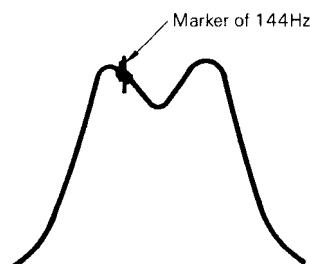


FIG. 13 WAVEFORM AT HELICAL SECTION

15. Voltage Setting of RX, HET

- (1) Disconnect all the measuring instruments. Set the channel indicator to "00" and the BAND switch to 144.2MHz.
- (2) Connect RF VTVM to the TP terminal on the RX unit (see Fig. 14 and Fig. 15).
- (3) Adjust VR4 on the RX unit until the voltage reaches 0.3V.

NOTE: When the voltage does not reach 0.3V with VR4, turn L19 (less than 1/4 turn) on the synthesizer unit (Fig. 2).

ADJUSTMENTS

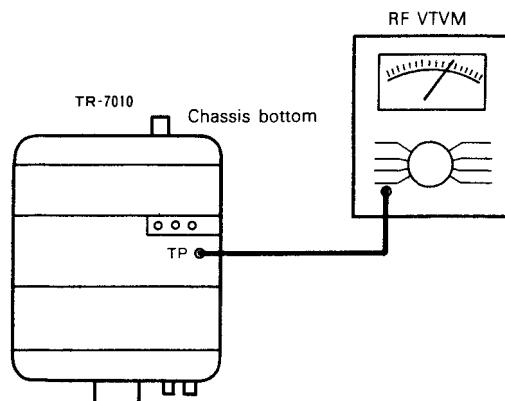


FIG. 14 RX, HET VOLTAGE SETTING

16. "0" Point Setting of S Meter

A. Setting positions of knobs on panel

Receiving mode.

Channel indicator: "00"

BAND switch: 144.2MHz

RF GAIN volume: Fully clockwise (MAX)

VFO-SYNTHESIZER selector switch: SYNTHESIZER position

Antenna terminal: Unconnected

Others: Any position

B. Adjustment

- Adjust VR2 on the RX unit (Fig. 15) until the S meter indicates the exact "0" position.

NOTE: Be sure to set VR2 at the point where the S meter deflects to the "0" position. It should be noted that the meter will not deflect in the "minus" direction even when VR2 is turned further after it has reached the "0" position.

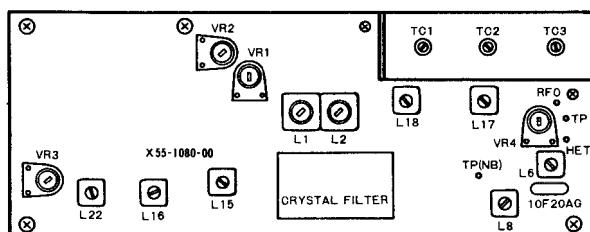


FIG. 15 RX UNIT

17. Adjustment of Receiving Sensitivity

A. Setting positions of knobs on panel

Same as the item 16 above.

B. Adjustment

- Connect the measuring instruments as shown in Fig. 16.

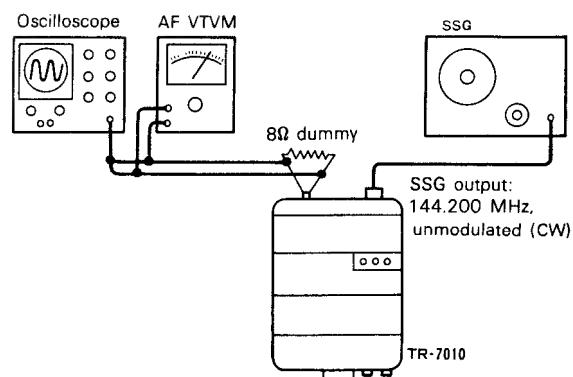


FIG. 16 RECEIVE SENSITIVITY ADJUSTMENT

- Using the input from SSG, tune in to about 144.200MHz and fine adjust VXO volume so that AF signal of about 1.000Hz is obtained on the oscilloscope.
- Slowly decrease the input from SSG and obtain a maximum reading on AF VTVM by adjusting L1 → L2 → TC3 → L6 → L8 → L15 → L16 → L22 on the RX unit (Fig. 15). This adjustment should be repeated several times.
- With the SSG input set to the minimum sensitivity (0dB), precisely adjust TC3 for maximum reading on AF VTVM.

18. NB Adjustment

Remaining the condition of the item 17.

A. Adjustment without synchroscope

- Connect a voltmeter (or tester) to the TP terminal on the RX unit (Fig. 17). Set the SSG input to 20 ~ 30dB and then adjust L17 and L18 for minimum reading on the voltmeter. During the adjustment, the AF waveform should be about 1,000Hz.
- Connect the noise generator to the ANT terminal and fine adjust L17 until the noise waveform on the oscilloscope becomes minimum.

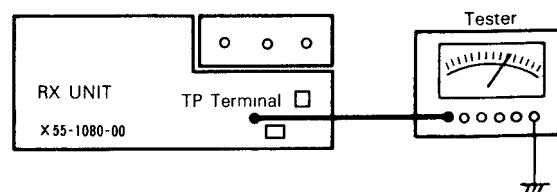
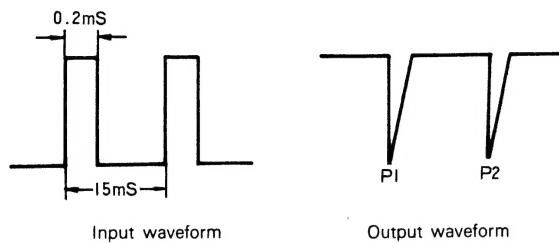


FIG. 17 NB ADJUSTMENT

ADJUSTMENTS

B. Adjustment with synchroscope

- (1) Set the SSG input to 20dB and connect the voltmeter (3V range) to the TP terminal (Fig. 17). Adjust L17 and L18 for minimum reading on the voltmeter. L17 needs readjustment.
- (2) Disconnect SSG and connect the pulse generator in place of it.
- (3) By connecting the synchroscope to Q10 collector, a waveform shown below will be produced.



- (4) Adjust L18 so that the level of P2 becomes equal to that of P1.
- (5) Turn the NB switch to ON and OFF to check the effect of the noise blanker.

NB Effect:

When the switch is turned to ON, the pulse noise on the oscilloscope is decreased almost to the normal noise level where the S meter reading is also decreased.

19. S Meter Adjustment

Remaining the condition of the item 18.

- (1) Disconnect the noise generator and tune in to the signal of SSG. Adjust the VXO volume for maximum deflection of the S meter (preferably for "5" position on the meter scale).
- (2) Next, adjust VR3 in the balancing detector of the RX unit (Fig. 15) for minimum deflection of the S meter.

- (3) With the SSG output set to 20dB, adjust VR1 until the S meter indicates the "9" position.
- (4) Set the SSG output to 0dB. If the S meter reading is more than "3", turn L16 clockwise until the meter indicates between "2" and "3". After turning L16, check the Step (3) above and when the meter indication is deviated, then readjust VR1.

20. Start Point of S Meter Deflection

The S meter should deflect as 6dB of SSG output (the meter should start deflecting at less than 6dB).

21. Sensitivity Measurement

When the carrier frequency (CW) is cut off at -6dB of SSG output, the S/N ratio should be better than 10dB.

22. Check Items

- (1) All the adjustments should be performed using DC13.8V.
- (2) In the sensitivity measurement, the S/N ratio should be better than 10dB at -6dB input.
- (3) The transmitting and receiving operations should be normal when external VFO is connected with the VFO-SYNTHESIZER selector switch set to "VFO".
- (4) The oscillating condition should be normal when operated with power voltage of 11.5 ~ 16.0V.
- (5) At a vacant channel, the operation should stop without causing abnormal oscillation.
- (6) Both the AGC properties and AGC time constant should be normal.
- (7) When a key is connected to the KEY terminal, CW signal should be emitted normally in CW mode.
- (8) The pilot lamp and the light emission diode should be lit normally.
ON AIR: Lights up in TX mode.
BAND indicator: Lights up in 144.2MHz Band.

CHANNEL INSTALLATION

INSTALLATION OF OPTIONAL CHANNEL

1. Installation

The unit employs the frequency synthesized system, permitting installations of 8 additional channels; it is provided with 2 crystal sockets for installations so that each crystal covers 4 additional channels.

- * The frequency of any additional channel can be selected in the range of 144.0 ~ 145.0MHz. Use the following equation to obtain a crystal oscillating frequency:
 $X_f = (fd - 135,800.0) \text{ kHz}$
Where Xf: Crystal oscillating frequency (kHz)
fd: Additional channel wanted frequency (kHz)

Because of the synthesized system, the relation between the indications on the dial and the frequencies are:

| Channel Indication | Frequency |
|--------------------|------------|
| A | fd kHz |
| B | fd + 5kHz |
| C | fd + 10kHz |
| D | fd + 15kHz |

NOTE: Each crystal operates at the corresponding position of the BAND selector switch. For example, if a crystal is plugged into the "A" socket, it operates only at the "144.1MHz" position of the switch and does not operate at "144.2MHz" position.

Example: For installation of 144.050MHz channel

Use 8.250MHz crystal (for TR-7010) because the crystal oscillating frequency is $144.050 - 135.8 = 8.250\text{MHz}$.

Practically, the following channels can be additionally installed:

| | |
|---------------|--|
| A: 144.050MHz | — Wanted frequency |
| B: 144.055MHz | Frequency related to wanted frequency |
| C: 144.060MHz | |
| D: 144.065MHz | |

2. Installing the Crystal

Remove the upper lid of the case fixed with 2 screws. Then, insert the crystal of desired channel into the crystal socket on the printed circuit board (Fig. 18).

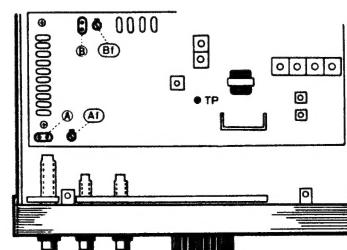


FIG. 18 INSTALLATION OF OPTIONAL CRYSTALS

Ⓐ Crystal socket for "144.1MHz" position of BAND switch.
Ⓑ Trimmer to adjust oscillation frequency of crystal in "Ⓐ" socket.
Ⓒ Crystal socket for "144.2MHz" position of BAND switch.
Ⓓ Trimmer to adjust oscillation frequency of crystal in "Ⓒ" socket.
Note: The trimmers other than 'Ⓐ' and 'Ⓒ' are factory adjusted and require no further attention.

3. Frequency Adjustment

A. Setting positions of knobs on panel

Receiving
RIT volume: 12 hour (center) position
RIT switch: ON
VFO-SYNTHESIZER selector switch on the rear side: SYNTHESIZER position
Channel indicator: "A"
BAND switch: Set to the position corresponding to the additional channel crystal.

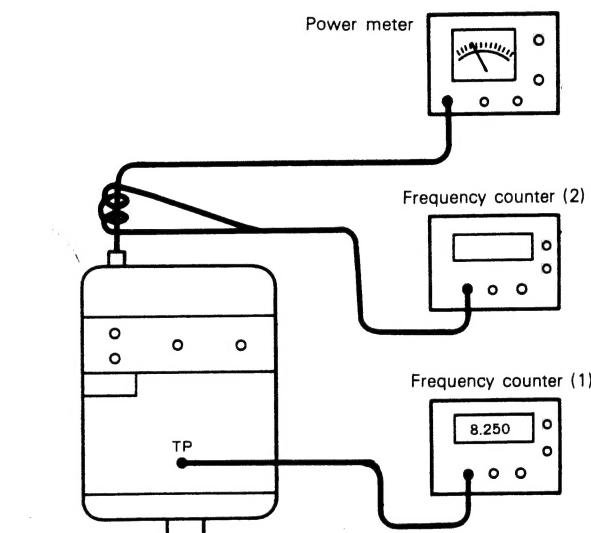


FIG. 19 FREQUENCY ADJUSTMENT

B. Adjustment

- (1) Connect the frequency counter (1) to the TP terminal and the power meter to the ANT terminal (see Fig. 18 and Fig. 19).
- (2) Perform adjustment on the bands of additional channels by referring to Table 3 below.
- (3) Connect the frequency counter to the point (2) and set the unit in CW transmit mode. Change the position of the channel indicator from A to B, C and D to check that the frequency increases by 5kHz at each position.

| Band | Channel Indicator | Adjusting Frequency | Adjusting Trimmer (Fig. 18) |
|-------|-------------------|--|-----------------------------|
| 144.1 | A | Frequency (Xf) of additional channel crystal | Af |
| 144.2 | A | Same as above | Bf |

TABLE 3

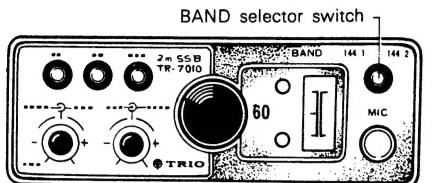
REFERENCE

REFERENCE

1. Dial Indication and Reading

The figure shown on the dial represents the last 2 numbers of the operating frequency. By using the BAND selector switch, the frequency band can be changed quickly to 144.1MHz or 144.2MHz (quick QSY).

The frequency reading is illustrated in Fig. 20.



Frequency indicated is:

- ① Setting of BAND switch → 144.160MHz
- ② Setting of BAND switch → 144.260MHz

NOTE: The frequency differs from 144.60MHz of FM unit.

FIG. 20 FREQUENCY READING

2. Power Cord Connection

When connecting the power cord, be sure that the polarity of the cord and plug is correct (Fig. 21).

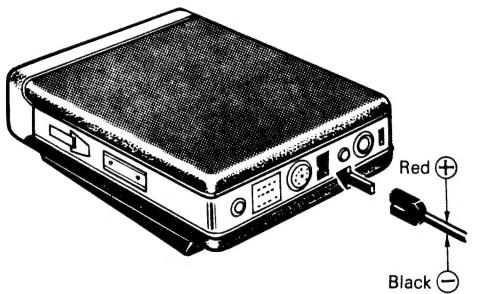


FIG. 21 POWER CORD CONNECTION

3. Key Connection

A miniature single-pin plug is supplied with the unit. Connect the plug to the key as shown in Fig. 22.

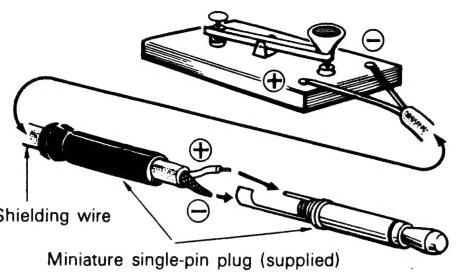


FIG. 22 KEY CONNECTION

4. AUX Terminal

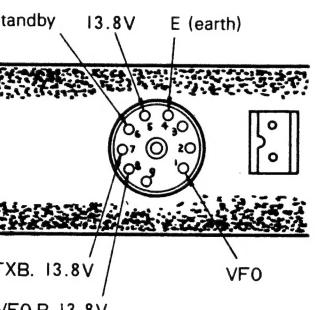


FIG. 23 AUX TERMINAL
(VIEWED FROM THE REAR OF SET)

5. Connection of Microphone Connector

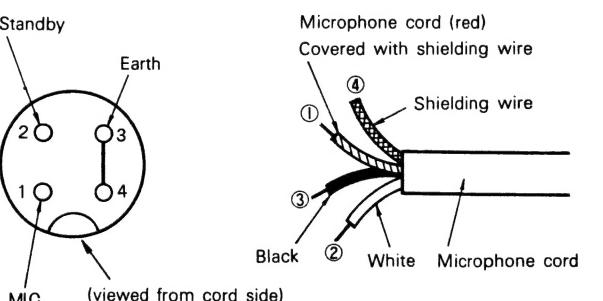
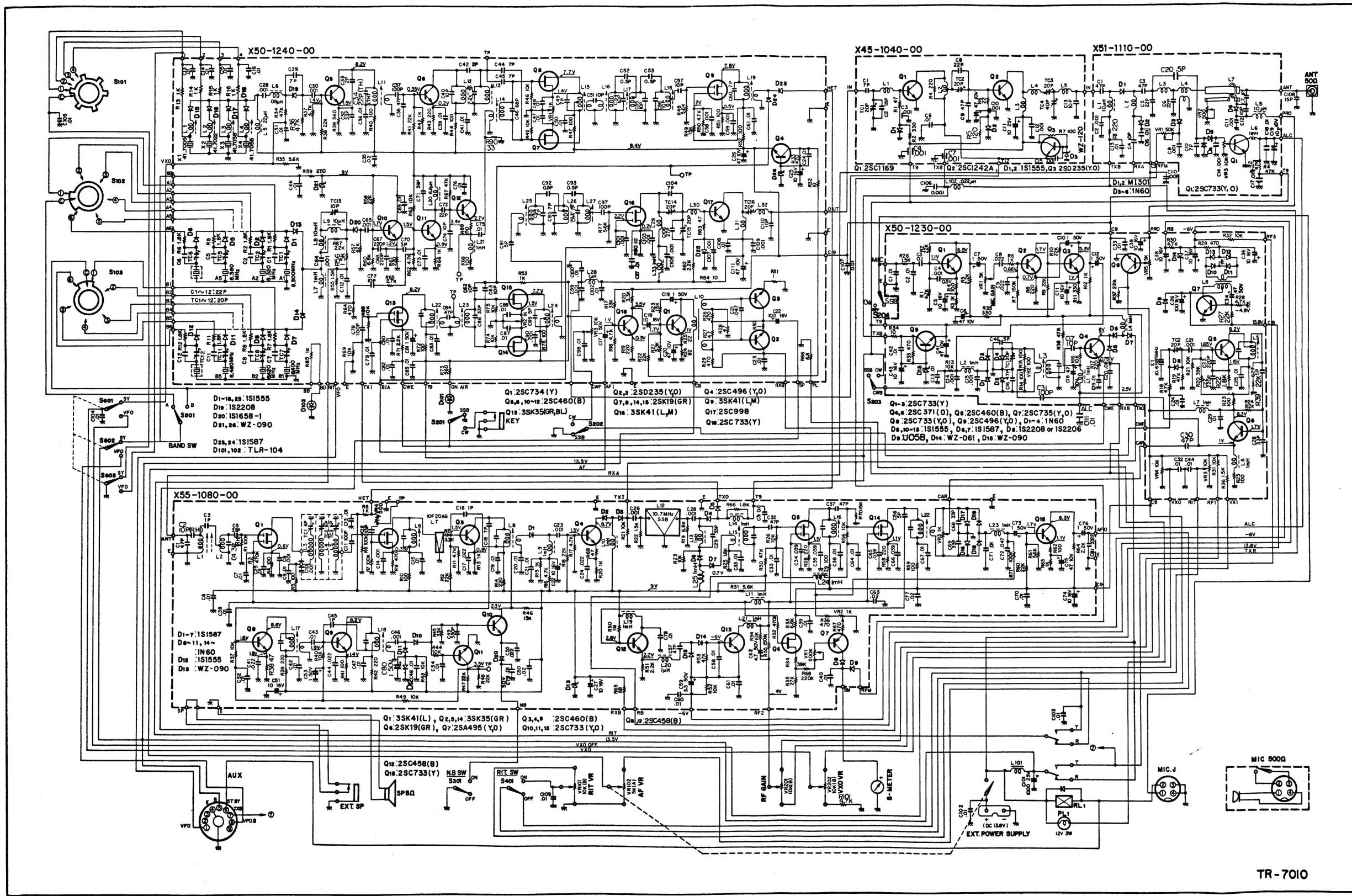
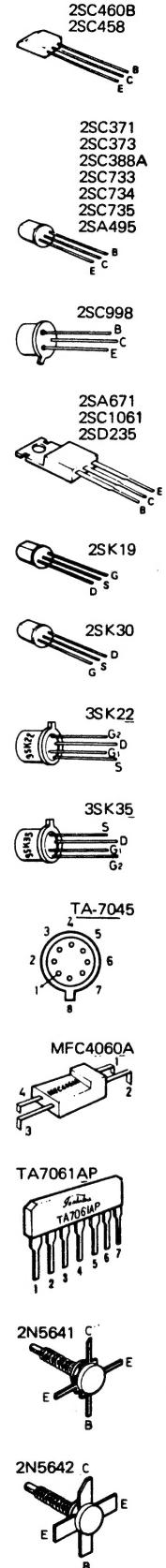


FIG. 24 CONNECTION OF MICROPHONE CONNECTOR

SCHEMATIC DIAGRAM



TR-7010





Manufactured by TRIO KENWOOD CORPORATION, Tokyo, Japan